

An Assessment of the Cross Connection Protection Requirements in the State of Michigan



A project by the Michigan Department of Environment, Great Lakes, and Energy & the Graham Sustainability Institute at the University of Michigan



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*This public copy does not include the direct interview feedback collected from respondents.
Interview feedback is available upon request.*

Background

This project is prompted in part by two letters from the Michigan Backflow Prevention Association (MBPA) addressed to Michigan's governor in May of 2019 and December of 2020. These letters highlighted issues and concerns that have been a focus of discussion within EGLE in recent years (*see Figures 1a and 1b in appendix for full letters*). Concerns from the MBPA include inconsistency of existing regulatory requirements found in the Act 399 Administrative Rules and the Michigan Plumbing Code, as well as inconsistency of implementation across local jurisdictions. Currently, backflow prevention varies between states as the Federal Safe Drinking Water Act under the Environmental Protection Agency (EPA) does not include any backflow requirements.

EGLE supports stakeholders in the backflow industry regarding the need for robust and comprehensive cross connection rules for the purpose of protecting public health. In the last decade, however, there have been multiple state legislative efforts to weaken the backflow prevention requirements in Michigan. To date, none of these bills have become law.

Approach

This project is being conducted by the **Graham Sustainability Scholars Program** at the **University of Michigan** and the **Michigan Department of Environment, Great Lakes, and Energy (EGLE)** to assess the current effectiveness of the cross connection (CC) protection programs throughout Michigan.

The intern provided by the Scholars Program worked with the Engineering Unit Supervisor and Distribution Engineering Specialist of the **Drinking Water and Environmental Health Division** within EGLE to develop online surveys for stakeholders in the backflow prevention and CC protection industry.

The survey effort captured in this document represents the preliminary phase of a larger effort to identify modifications needed for effective CC prevention in Michigan. The role of

this initial effort is to collect feedback from four specific stakeholder groups as it pertains to the requirements and implementation of Michigan’s official guidelines found in **Part 14, Cross-Connections**, of the administrative rules for the Michigan Safe Drinking Water Act, 1976 PA 399, as amended.

EGLE wanted to hear from both internal and external stakeholders in the industry. To do so, email contact lists were formed to engage four stakeholder groups (*a fifth stakeholder group consisting of commercial water customers was considered but omitted due to limited time and records*):

- A. **EGLE District Engineers** - All District Engineers working in EGLE’s Drinking Water and Environmental Health Division (DWEHD) were encouraged by their managers to complete the survey.
- B. **Water System Personnel** - This contact list for cross connection inspectors included both water system staff and industry contractors; contact information was collected from DWEHD regional staff familiar with cross connection personnel.
- C. **Certified Backflow Preventer Testers** - EGLE does not maintain a comprehensive list of certified testers and ASSE listings do not include contact information. Therefore, in order to build a contact list for qualified testers of backflow preventers, EGLE solicited existing lists of contact information from external industry groups.
- D. **Plumbing Code Officials (PCO’s)** - The contact list for licensed plumbing inspectors was provided by the Michigan Department of Licensing and Regulatory Affairs. However, many of the entries did not have email addresses listed.

(see appendix for further explanation of the individuals these stakeholder groups refer to)

The following data in this report represents the feedback collected from these stakeholders via surveys and interviews throughout the summer of 2021.

Limits

The duration of this project was constrained to the intern's allotted time of work, the summer of 2021. The vacation season may have also reduced the amount of potential participation.

After the surveys were closed in late August, one tester notified the intern that the winter season may be a more favorable time to collect feedback due to the backflow testing period in Michigan which takes place during 3-4 months of each summer.

Due to limited records and the need for a substantial sample size, information was not gathered from a randomized pool of participants. EGLE does not possess direct records for testers and plumbing code officials. While EGLE was able to obtain contacts from external entities, this limited the ability to account for geographic location and community size as well as the volume of surveys able to be sent. A lack of email addresses for Plumbing Code Officials resulted in a reduction of survey accessibility for that group in particular. In summary, the survey results within this document may not reflect those of a random sample.

What future work is needed? What progress needs to be addressed?

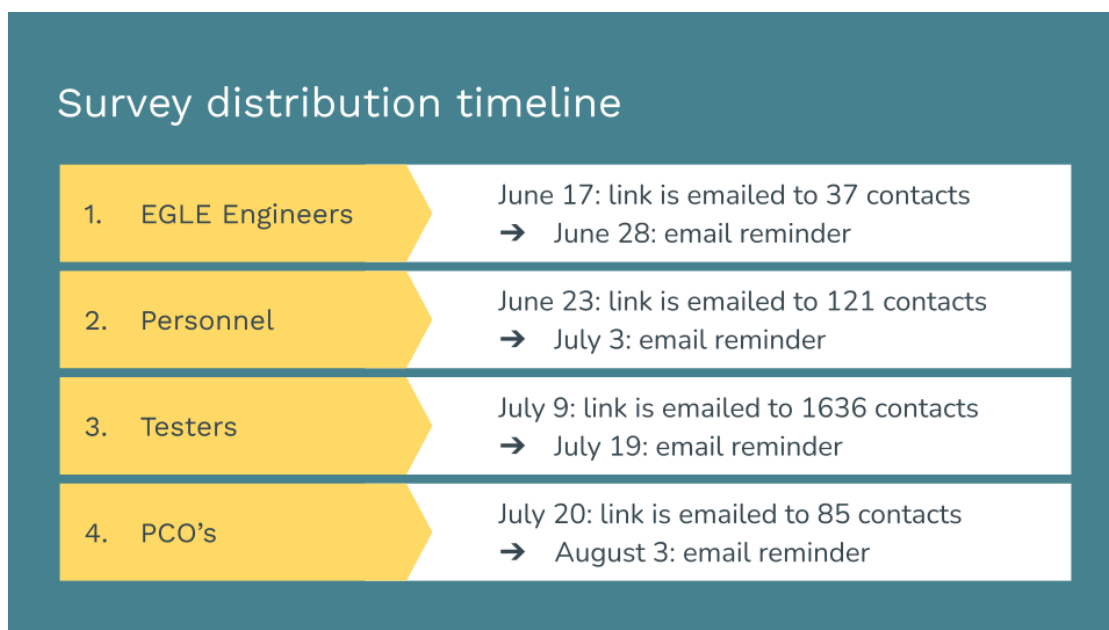
It is EGLE's intent to continue this work through partnership with the University of Michigan. The purpose of this document is to inform the next stages of the project. It is not yet confirmed who will be the team to utilize this information. It is thought that the next phases to come will include the tasks of utilizing this report to conduct a comprehensive review of pertinent laws and codes and an evaluation of the effectiveness, equity, and feasibility of Michigan's regulatory approach to cross connection control.

Later stages would also include a review of what other states are doing and what the EPA (Environmental Protection Agency) expects; afterwards, this final report would be used to have a conversation with stakeholders about how and where to improve. Regardless of this project, any changes to Act 399 Rules will require stakeholder involvement.

It is also hoped that this project will help inform Michigan lawmakers as they consider how to appropriately regulate backflow prevention.

Project Overview

1. One survey per stakeholder group was drafted, edited, and finalized.
2. Surveys were distributed by email using Qualtrics - a survey platform available to University of Michigan students.
 - 2.1. Each stakeholder group received the survey link from the intern via email; each link was preceded by an introductory email from the Engineering Unit Supervisor for validation, context, and encouragement in participation (see *Figure 3 in appendix for email messages*).



A reminder was sent via email to participants with incomplete responses.

3. Those who indicated interest in providing further feedback were contacted by the intern (largely via phone call).
4. Responses were collected as participants sent submissions in; all surveys were closed for further entries on August 14, 2021.

Survey Overview

Participation was encouraged but entirely voluntary. The completion rate indicates that there are some partial responses - that is, a survey started but not completed; all partial feedback is included in the survey data that follows. The testers group accounts for the largest stakeholder group size as well as the largest amount of partial responses. While 85 PCO contacts were obtained, the group showed the least amount of participation with only 7 surveys recorded.

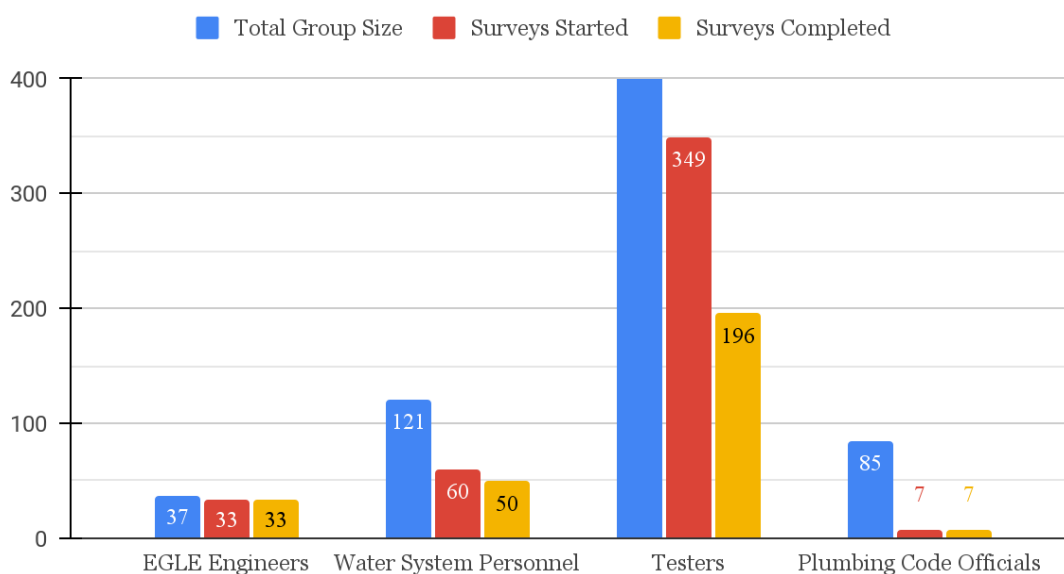
Furthermore, there were no required fields in any of the surveys; each individual survey question was optional.

**Total Group Size refers to the number of contacts per stakeholder group i.e. the number of emails that received the survey link*

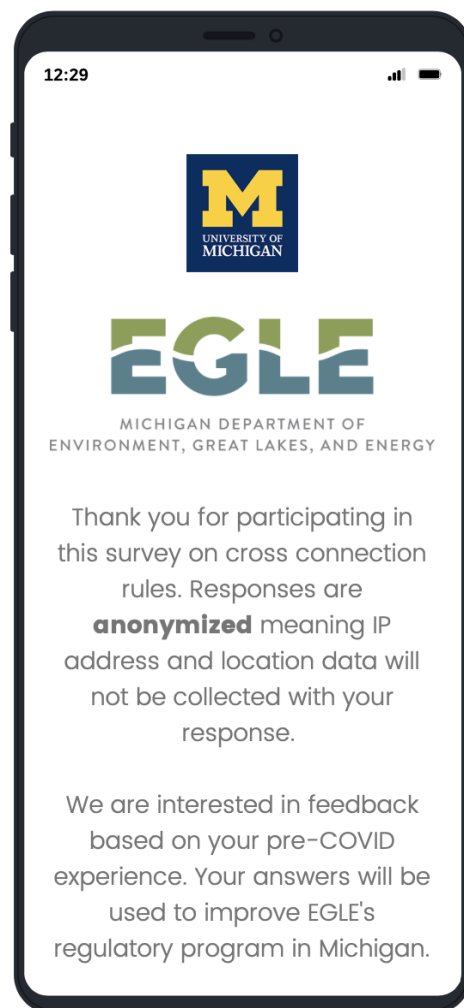
Group	Total Group Size*	Surveys Started	Surveys Completed	Completion Rate
A. EGLE Engineers	37	33	33	100%
B. Water System Personnel	121	60	50	83%
C. Testers	1636**	349	196	56%
D. Plumbing Code Officials(PCO)	85	7	7	100%

***For ease of interpreting chart below, the testers group size (1636) is not fully represented in bar height*

Group Size and Response



Each survey consisted of 9-15 questions. The majority of survey questions were multiple choice with a few open answer questions; the intention was to make supplying feedback as simple and quick as possible throughout the entire process. It was very important to EGLE that participants felt comfortable providing candid feedback without constraint. To do so, all responses were anonymized through the Qualtrics platform used. This was communicated via email and upon opening the survey link (*see mobile view below and desktop view on next page*).



All four surveys links opened with the following message:



Thank you for participating in this survey on cross connection rules. Responses are **anonymized** meaning IP address and location data will not be collected with your response.

We are interested in feedback based on your pre-COVID experience. Your answers will be used to improve EGLE's regulatory program in Michigan.

At the end of the survey, you will be given the option to provide your name as well as the opportunity to provide further feedback in an interview as time allows for the volume of those interested.

You will be able to leave and return to the survey at any time. The link will expire 3 months after you first access the link. The survey will begin on the next page.

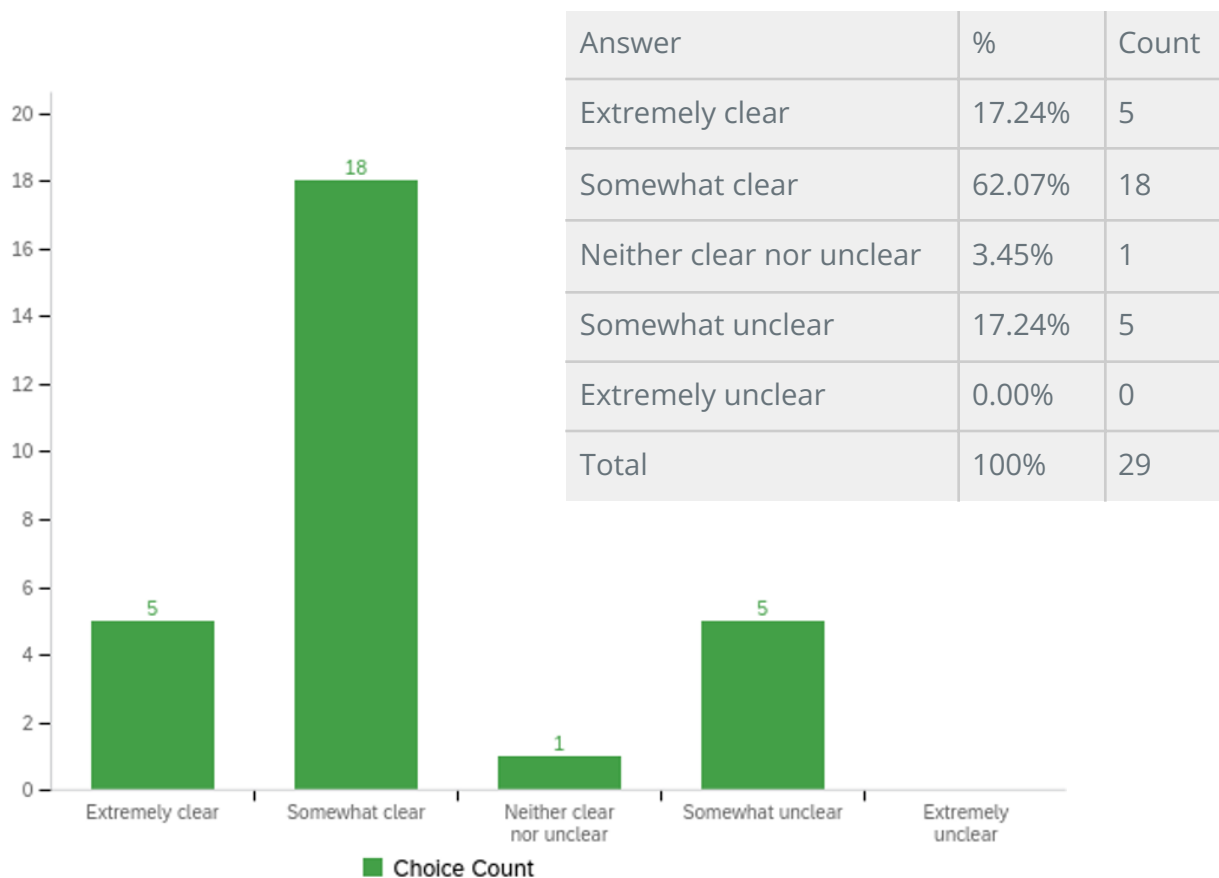
Survey Data

The individual stakeholder survey questions are as outlined in the pages below (see Figure 5 in appendix for a comprehensive view of the questions without participant data).

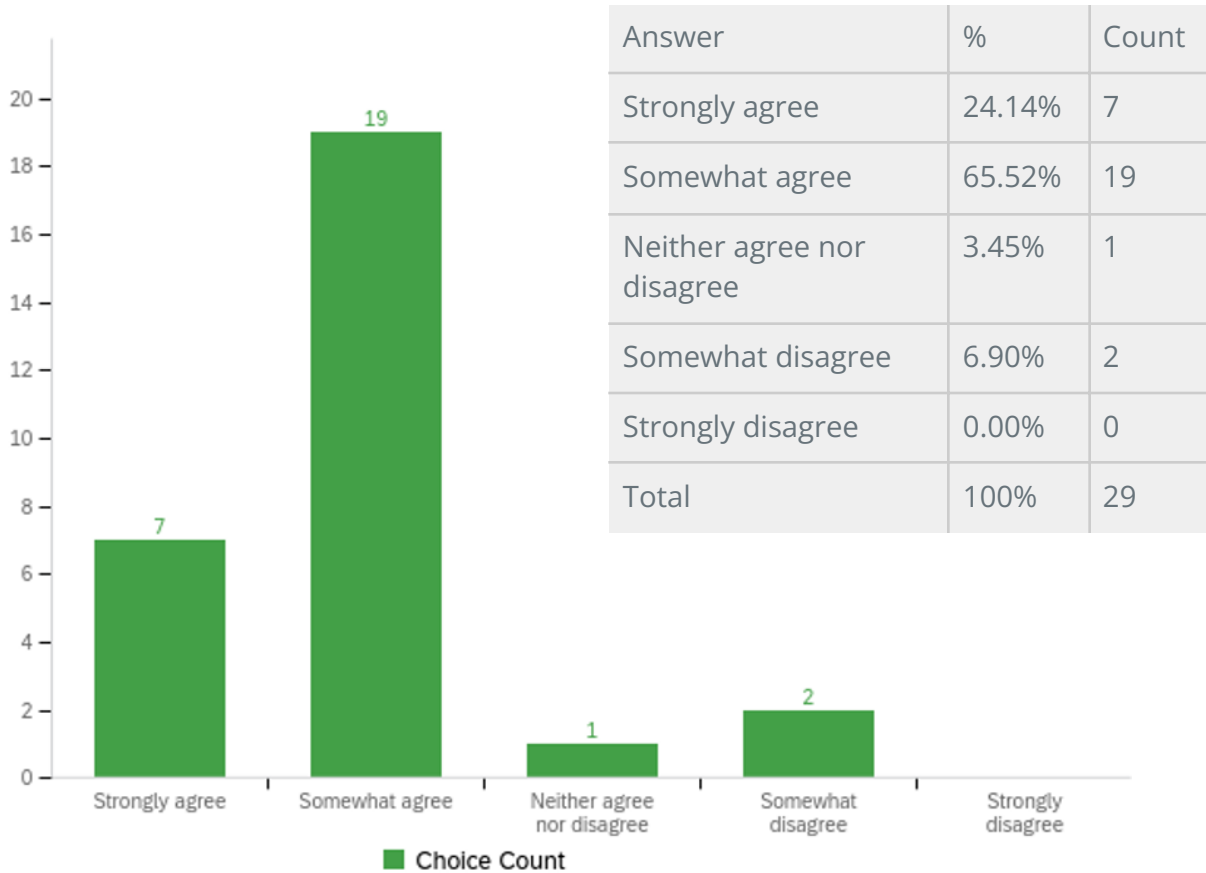
EGLE District Engineers (8 questions total)

Report generated August 16th 2021, 11:24 am EDT

Q1 - Please select the most accurate statement. The set of conditions necessary in rating a water system's cross connection control program (deficient, significantly deficient, etc.) are ___ to me.



Q2 - I have received sufficient training and guidance materials to evaluate if a water system's cross connection control program meets the Part 14 requirements.



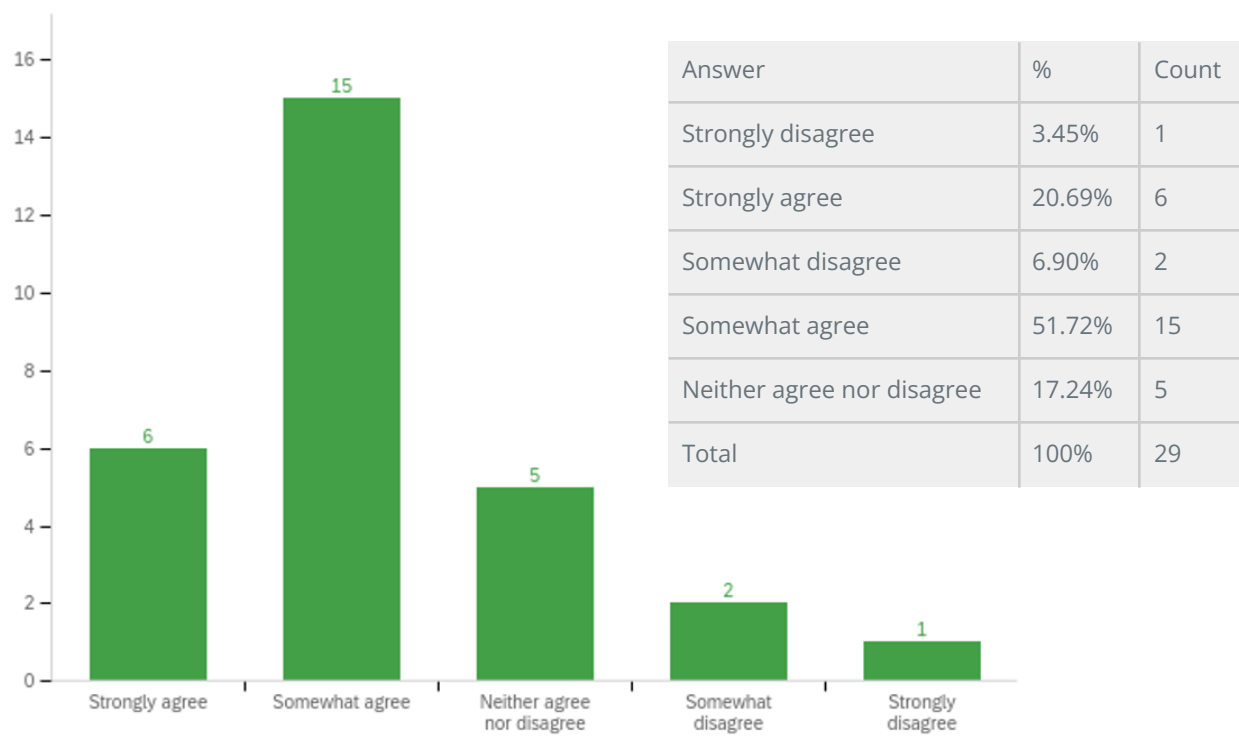
Q3 - Please list any measures you take to ensure your evaluation of a water system's cross connection control program is consistent with others statewide.

25 entries total, responses are direct quotes from participants

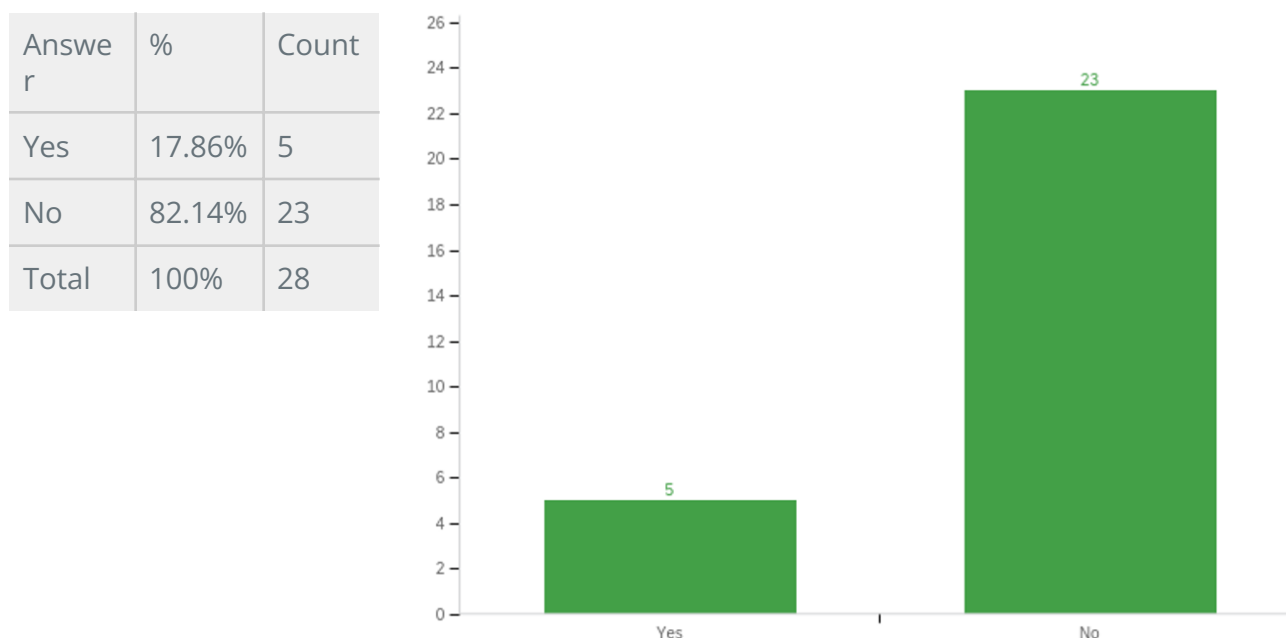
1. Took the cross connection course, read the rules for cross connections
2. I use the Cross Connection Rules Manual, Part 14 of Act 399, and Engineer's Board
3. Visual Inspection, Photo Documentation
4. Outside of discussions that have been brought up at routine engineering meetings as to what other offices deem deficient, no action has been taken.
5. Having the following items followed: Annual Cross Connection Report as reference, Michigan Cross Connection Rules Manual as reference, and Act 399 requirements.
6. Checking that the CCCP on file matches the requirements in Part 14, lists current personnel, and is signed by the water system owner.

7. Check annual reports and previous sanitary surveys for any communication.
8. Review a system's plan against our guidance document; utilize the sanitary survey checklist; check to see if they have a residential program; look at what they report on the annual reports to see if they are conducting inspection & testing
9. utilize standard evaluation checklists & supervisor collaboration
10. Follow the water supply sanitary survey checklist, utilize guidance provided during DWEHD engineering meetings, and discuss internally with district supervisor and engineers.
11. By referencing the XC rules manual, discussing with supervisor, talking with industry professionals, using the discussion board on the Sharepoint site, and discussing special cases at engineering meetings.
12. Evaluate the program against the requirements listed in Act 399
13. Read the current plan on file, look at prior annual reporting, and ensure that the two reflect the most recent rule revisions (ASSE testers, frequency of testing for untreated irrigation), and that the program includes residential accounts.
14. Review Annual CCC report and audit record keeping. Question OIC on who is responsible for program implementation.
15. peer review if any questions arise on the proper protection needed
16. Discuss during Unit meetings to be consistent with others within District and listen/participate in engineering unit meetings, engineering forum discussions to ensure I am being consistent.
17. Have surveys and violation letters reviewed by my supervisor. Talk to other engineers in district and out. Attend trainings. Send specific questions to [Name omitted]. Make sure residential inspections are required in survey letters. Ask during visits and surveys about cross connections.
18. with any questions, refer to the cross connection rules manual.
19. Ask about Residential, how often high hazard, low hazards are tested and inspected, review the cross connection report
20. Use relevant guidance from staff meetings
21. Checking if Annual Reports are submitted, and whether Residential accounts are included.
22. New to EGLE so haven't evaluated CCCP yet
23. Use of the predesigned checklist for sanitary surveys and comparison to the template program provided for small systems.
24. I discuss the commercial and residential programs with the water system to evaluate implementation, as well as review the annual reports submitted. Then I discuss my findings with my supervisor before finalizing the finding category (rec, def, Sig def) So far, nearly every water system with a distribution system has been issued a deficiency due to incomplete program implementation. One system received a significant deficiency because there were no records or ongoing cross connection efforts at all.
25. I review with my supervisor, isn't that good enough?

Q4 - Considering information in the water supply files and the information gained from the sanitary survey checklists, I feel that I have sufficient information to adequately evaluate the cross connection control program.

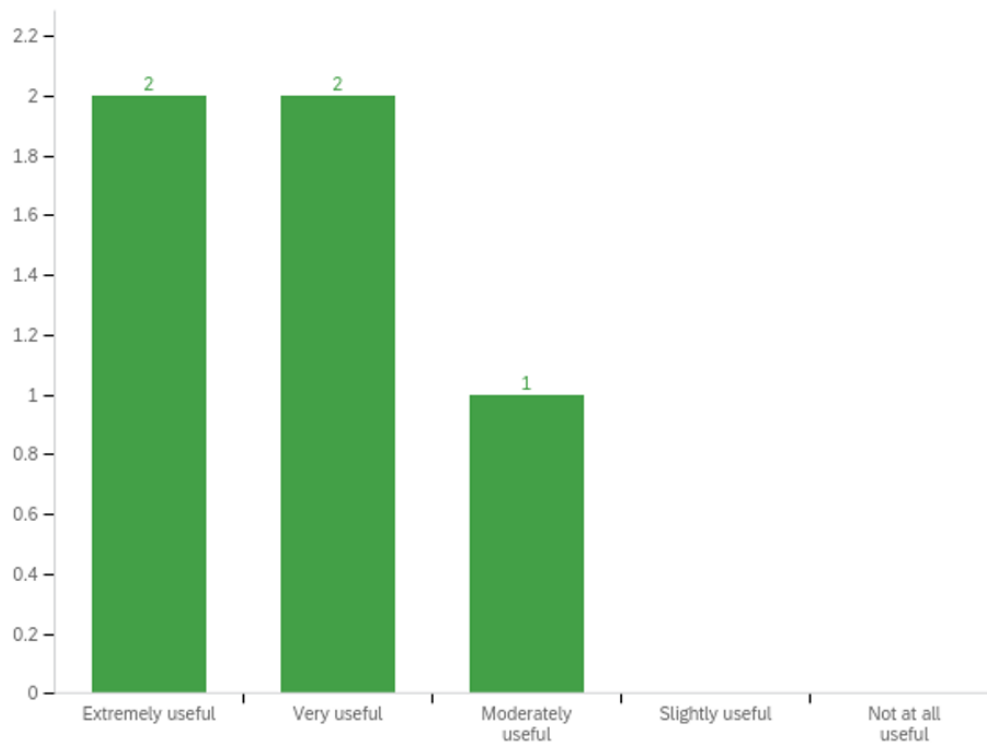


Q5 - Have you had the opportunity to accompany a cross connection inspector on an actual local cross connection inspection?

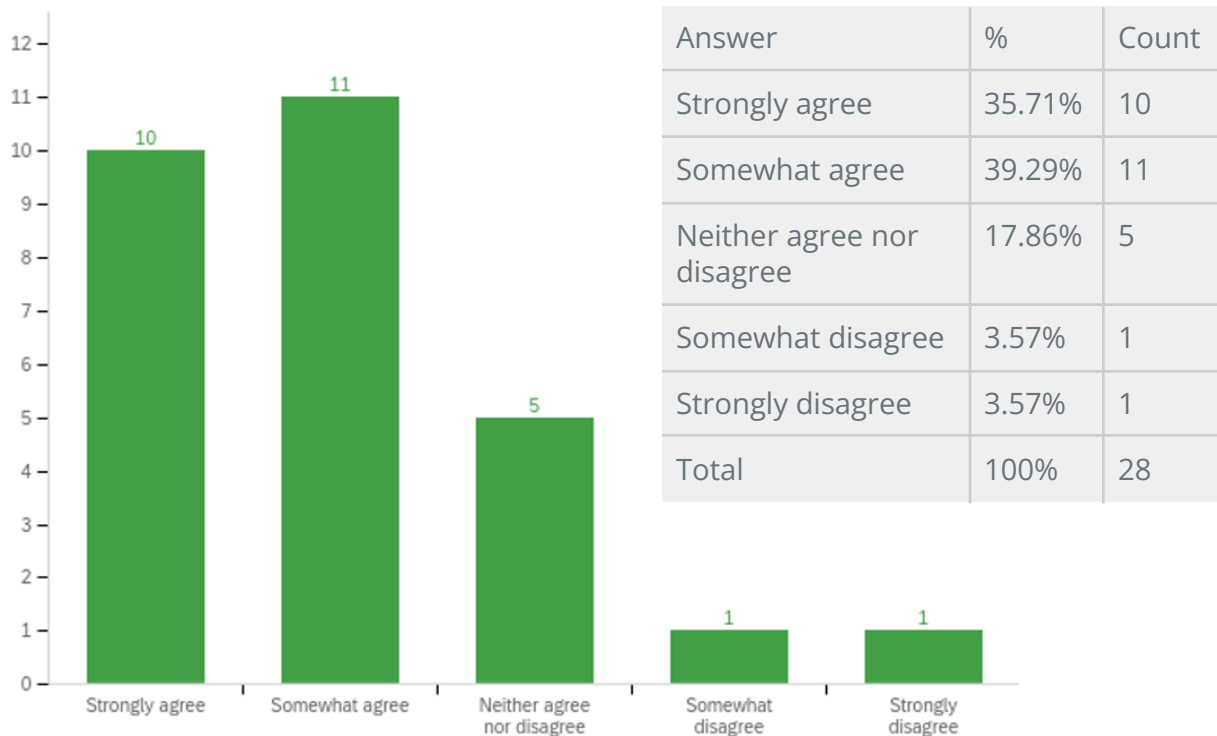


Q5A - How useful or not useful was your local inspection experience?

Answer	%	Count
Extremely useful	40.00%	2
Very useful	40.00%	2
Moderately useful	20.00%	1
Slightly useful	0.00%	0
Not at all useful	0.00%	0
Total	100%	5



Q6 - When reviewing sanitary surveys with my supervisor, cross connection control consistency is discussed.



Q7 - If there is any other feedback to improve the Part 14 rules and how they are implemented in Michigan, please explain.

18 entries total, responses are direct quotes from participants

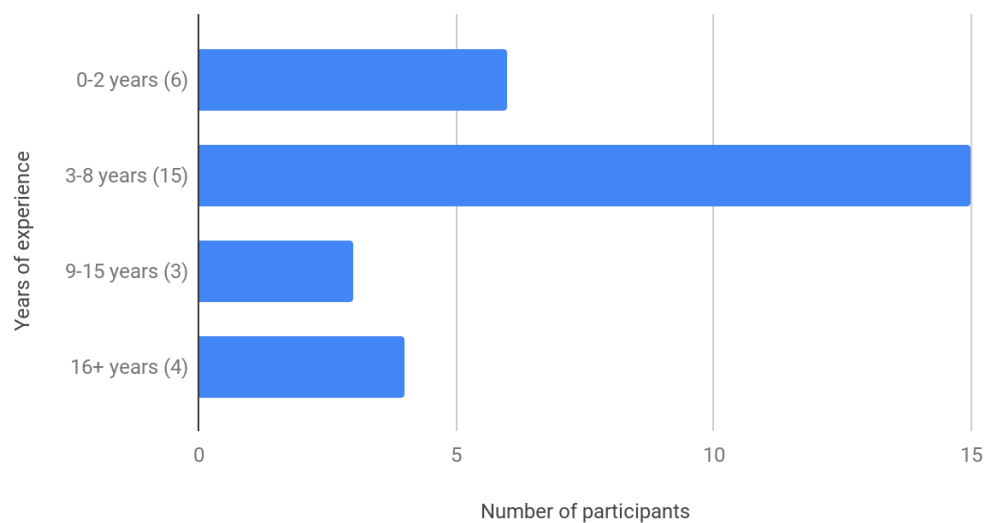
1. Additional training for engineers
2. Include a way to report residential account inspections and testing
3. Annual cross connection control reporting form would need a revisit for discussion and revision.
4. Update the Cross Connection Rules Manual. The latest version is 2008. Provide training so inspectors can recognize a potential cross connection when on site. Be clear about expectations for CCCP review and approval. Verify exactly what is acceptable for prevention. Provide a color chart with good graphics, and cover FAQs. For example, is a hose bib vacuum breaker acceptable, when there is a nozzle at the end of the hose? Teach the Culligan man not to tie in water softener discharge lines to a sewer line. That's 80% of all cross connections I see.
5. Additional onsite or classroom training would be helpful. Identifying cross connections is challenging.

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6. I think more discussion on how to interpret the annual cross connection reports and use that information to assess how well a system's program is functioning would be helpful. Also, some communities have just an external residential program. How should we be addressing the internal component?
 7. Improved annual reporting by supplies and DWEHD tracking mechanism. Increased cross connection control training for district engineers
 8. Annual testing should be required to match the Plumbing Code. Need to implement a clear and concise guidance for residential implementation, useful for EGLE staff as well as PWS staff. More onsite training for EGLE staff. Ensure EGLE staff are requesting copies of inspection forms during sanitary survey. Other references can be added to Part 14 (AWWA M14, NFPA, EPA rules manual) Update EGLE XC rules manual. Update language that refers to plumbing code to be more clear Require ASSE certified inspectors Address containment VS isolation directly in the rule. Require ASSE 5140 for Fire suppression system (not covered by ASSE 5110) Update annual report form to allow better submittal of residential specific information
 9. So many communities are still confused surrounding requirements to include residential accounts in their programs-- it might be nice to have some externally focused trainings which specifically cover best practices for how to do so.
 10. No
 11. Have at least one EGLE engineer/EQA per office certified as a tester
 12. This survey of State Engineers and operators and inspectors is a great first step. Within the State the trainings and rule schools could be made more interactive with breakout groups periodically to discuss very specific elements of Part 14 and for that matter any specific rules.
 13. Since central staff is expanding, have central staff write memos to all the supplies, yearly, such as in a friendly newsletter, discussing updates, providing resources, etc. Spoon feed the overworked operators instead of relying on district engineers to push this. OICs often are eager to comply, but want templates and training to understand what success looks like.
 14. The rules are confusing to the water system and plumbing inspectors. They need to be simplified.
 15. The Cross Connection Manual is in need of serious updating. It seems to be based on 70s and 80s knowledge and experiences. In my opinion that's somewhat due to the fact that some of the most notorious backflow incidents are from long ago. But I also think the sample ordinance and sample programs need to be improved.
 16. Michigan's Annual Cross Connection Report Form for Type-1 water supplies is worded very confusingly and many systems fill it out incorrectly.
 17. I have either had operators tell me or noticed myself on submitted forms that the reporting forms are wildly inconsistent in how they are completed. Much of our review is focused on whether the form(s) is provided/complete, and it has become increasingly evident that many operators or inspectors are not sure what information to provide or how to report it. It is difficult to say how effective many systems actually; instead it feels that we are just confirming if anything is done at all.
 18. In the rules itself, it could be helpful to specify required inspection frequencies for each type of account (commercial vs industrial vs residential) and testing frequencies for testable devices. It would also be helpful to clarify the scope of the residential cross connection control program (every account inspected every 10 years no matter what? accounts with high hazard cross connections inspected more frequently?) If it's not easy to put this into the rules, then the guidance manual needs an update for better interpretation of the current rule set.
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Q8 - How many years of experience do you have in the drinking water industry?

Years of experience	Number of participants
0-2 years	6
3-8 years	15
9-15 years	3
16+ years	4
Field	Amount of years
Minimum	<1
Maximum	31
Mean	8.25
Count	28

Number of participants vs. Years of experience

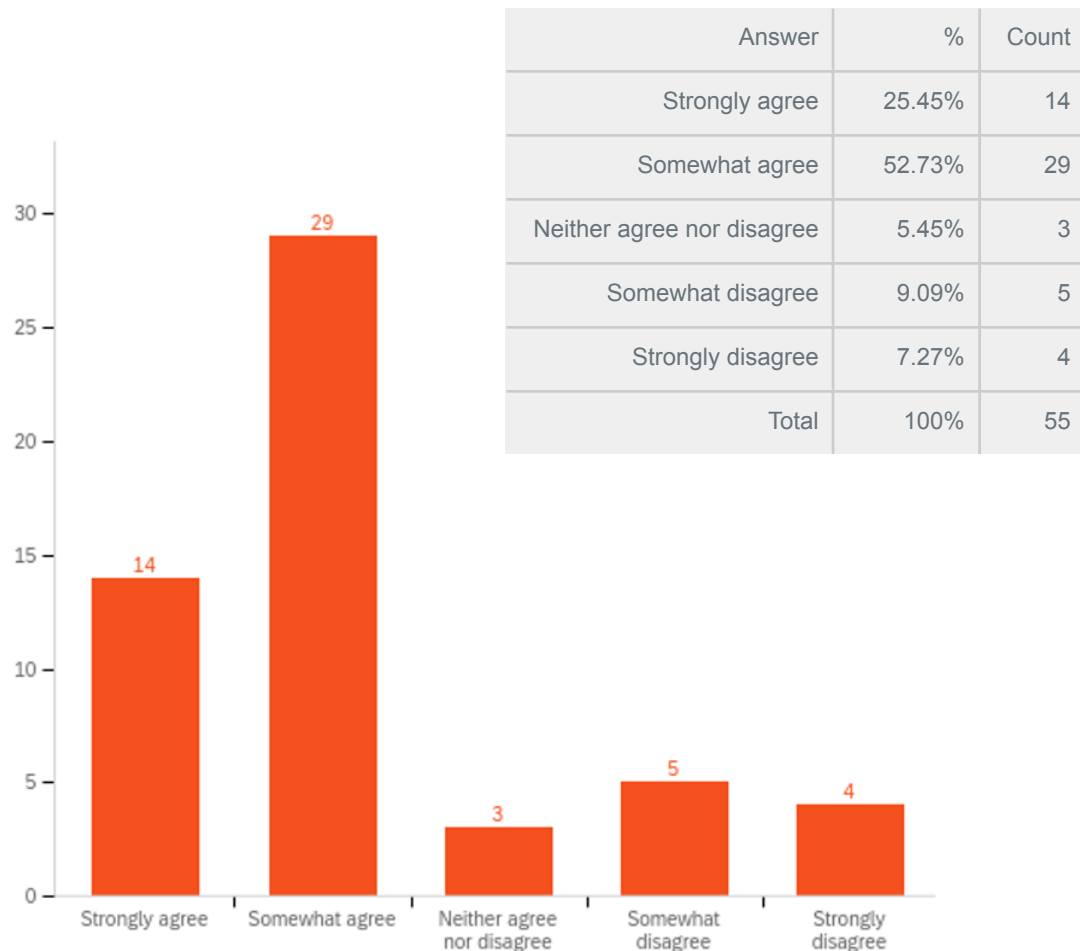


Survey Data (continued)

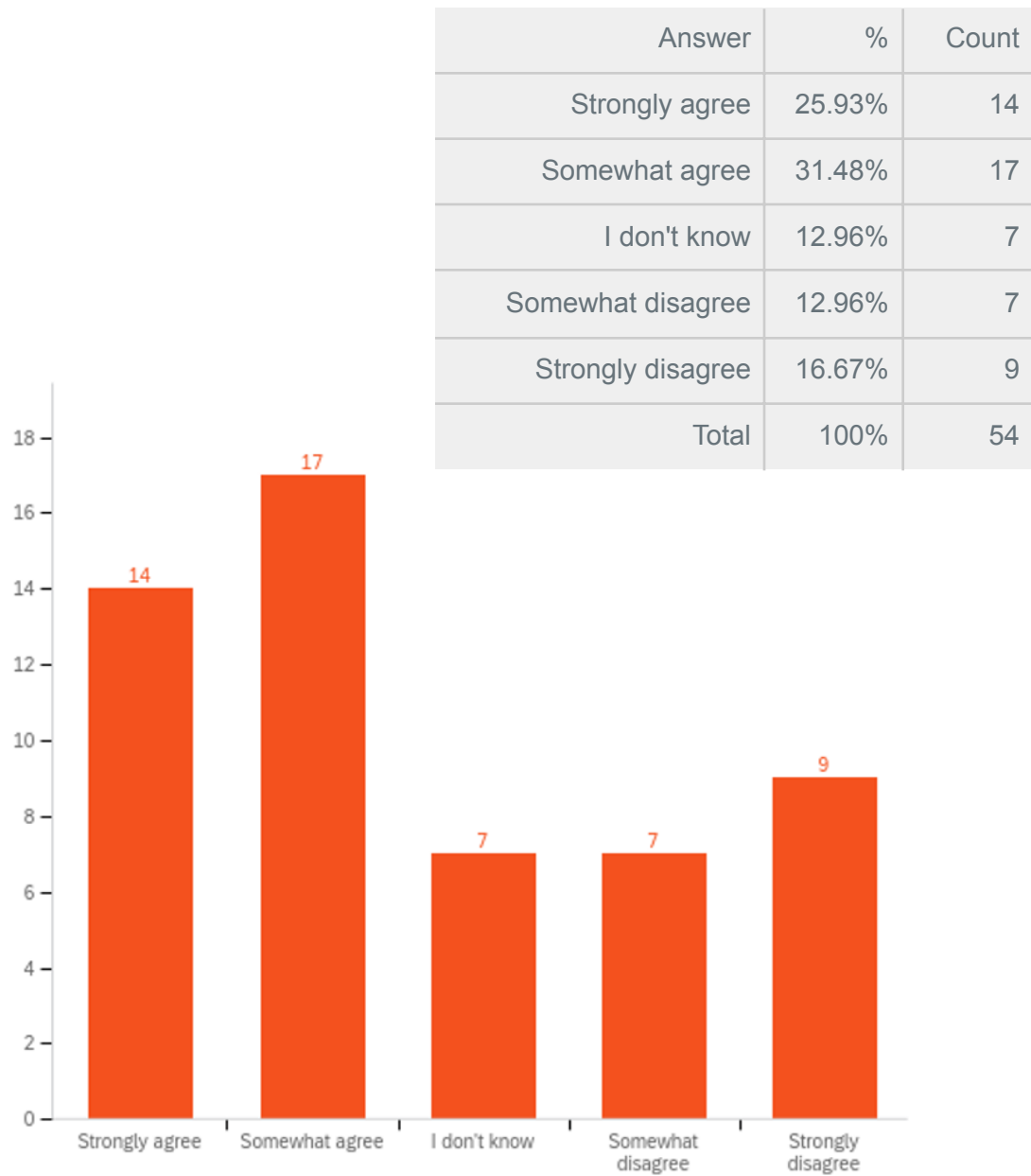
Water System Personnel (15 questions total)

Report generated August 22nd 2021, 9:54 pm EDT

1 - Please select the most accurate statement. The state rules and guidance make clear what I must do to comply with the state's cross connection rules.

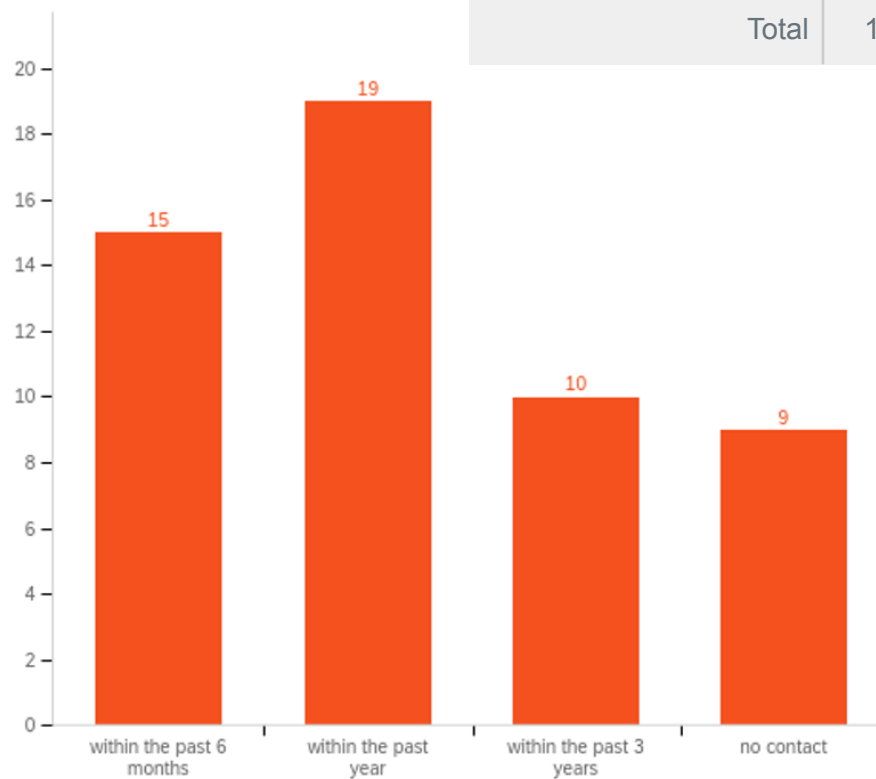


2 - In my view, EGLE is enforcing cross connection rules consistently in my region of the state.

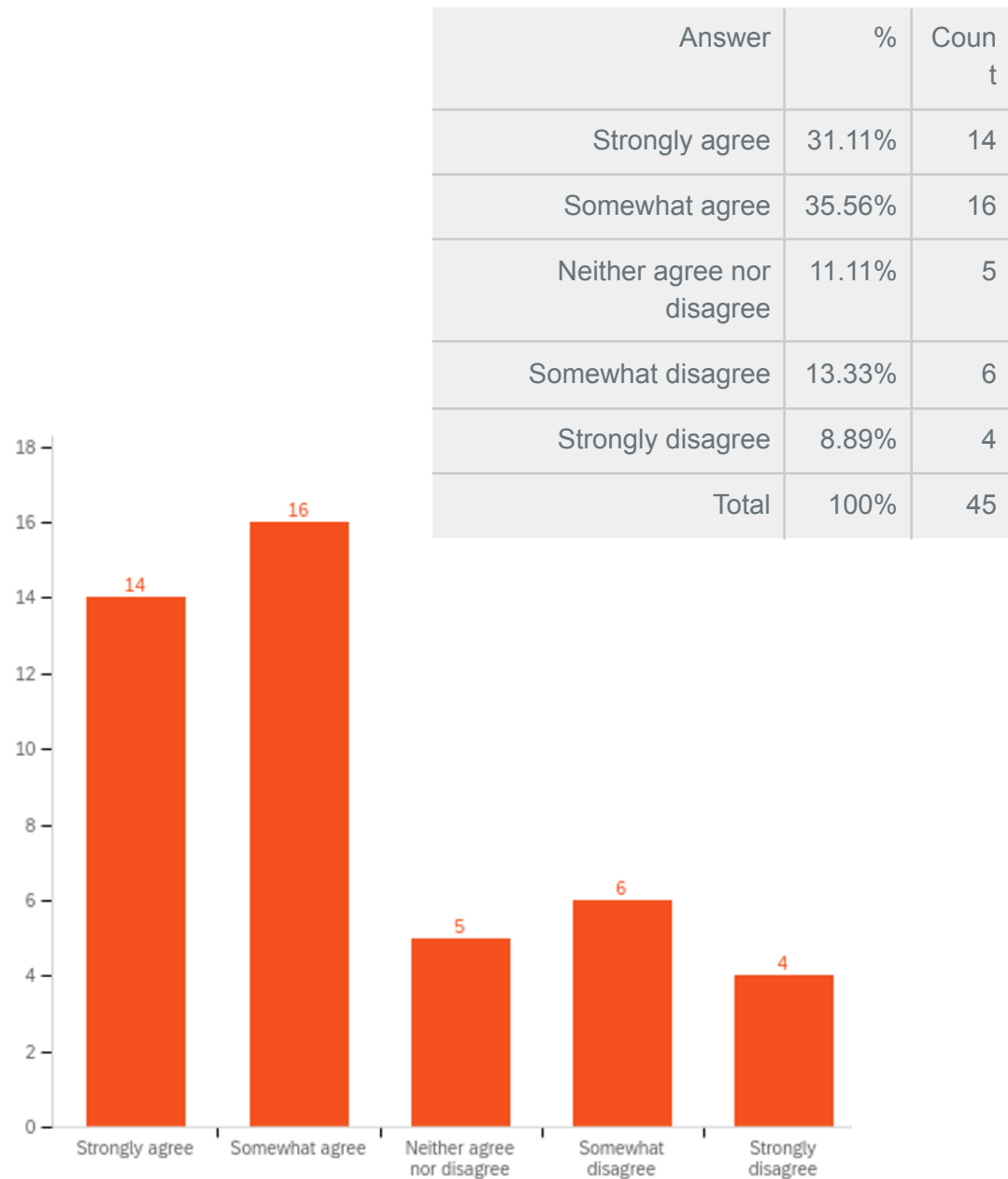


3 - When was the last time EGLE was in contact with you to specifically discuss your cross connection control program?

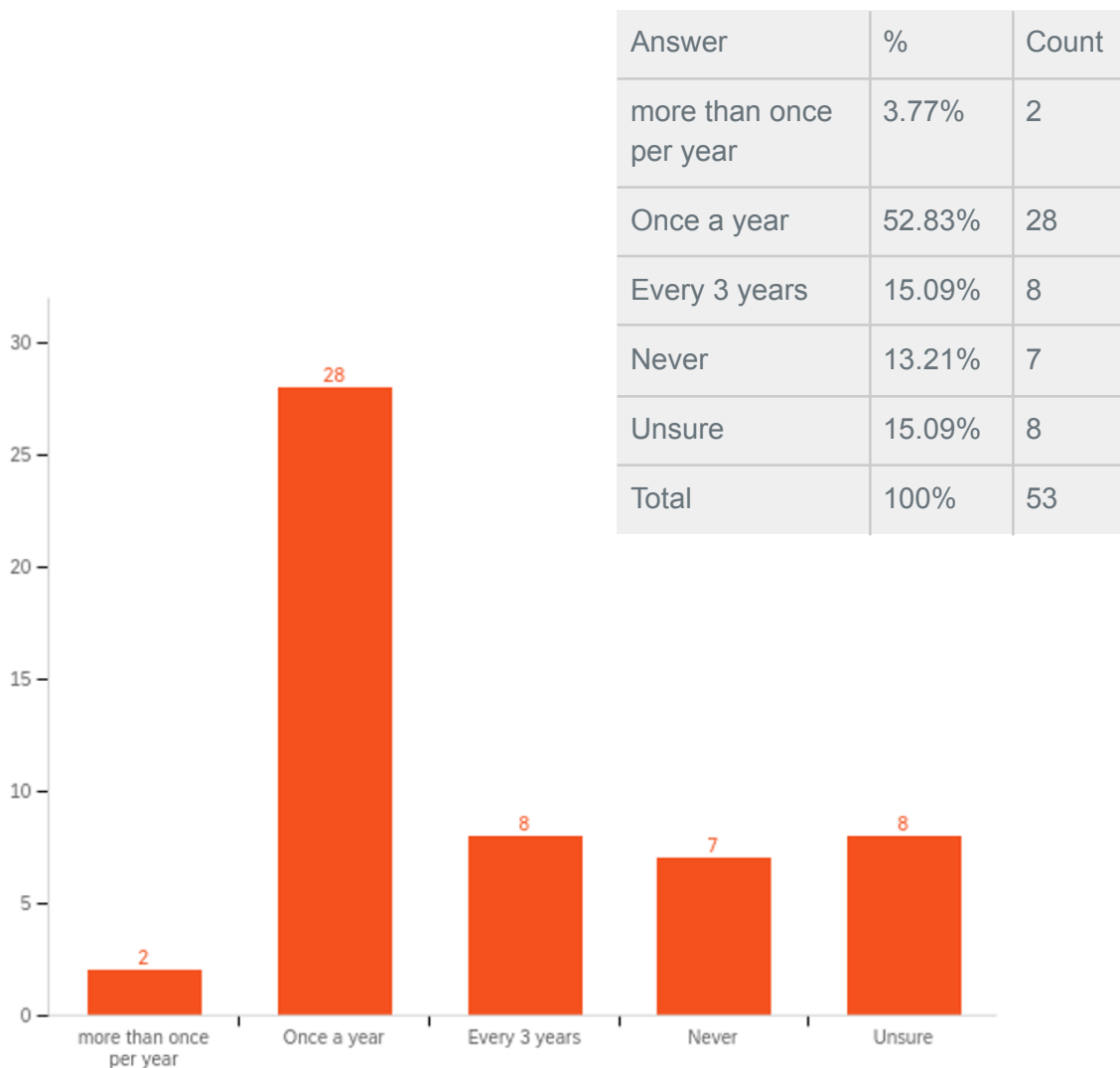
Answer	%	Count
within the past 6 months	28.30%	15
within the past year	35.85%	19
within the past 3 years	18.87%	10
no contact	16.98%	9
Total	100%	53



4 - I get clear and consistent direction from EGLE staff on their expectations regarding my local cross connection program.

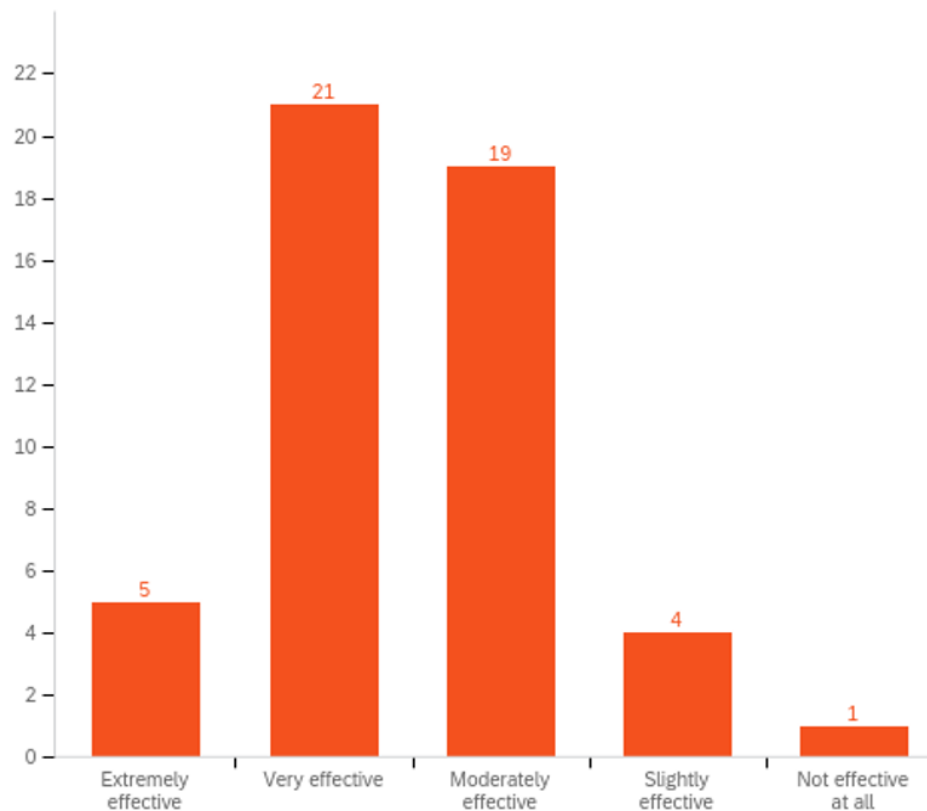


5 - Regulatory staff from EGLE request to see records to ensure testing and inspections are being completed.



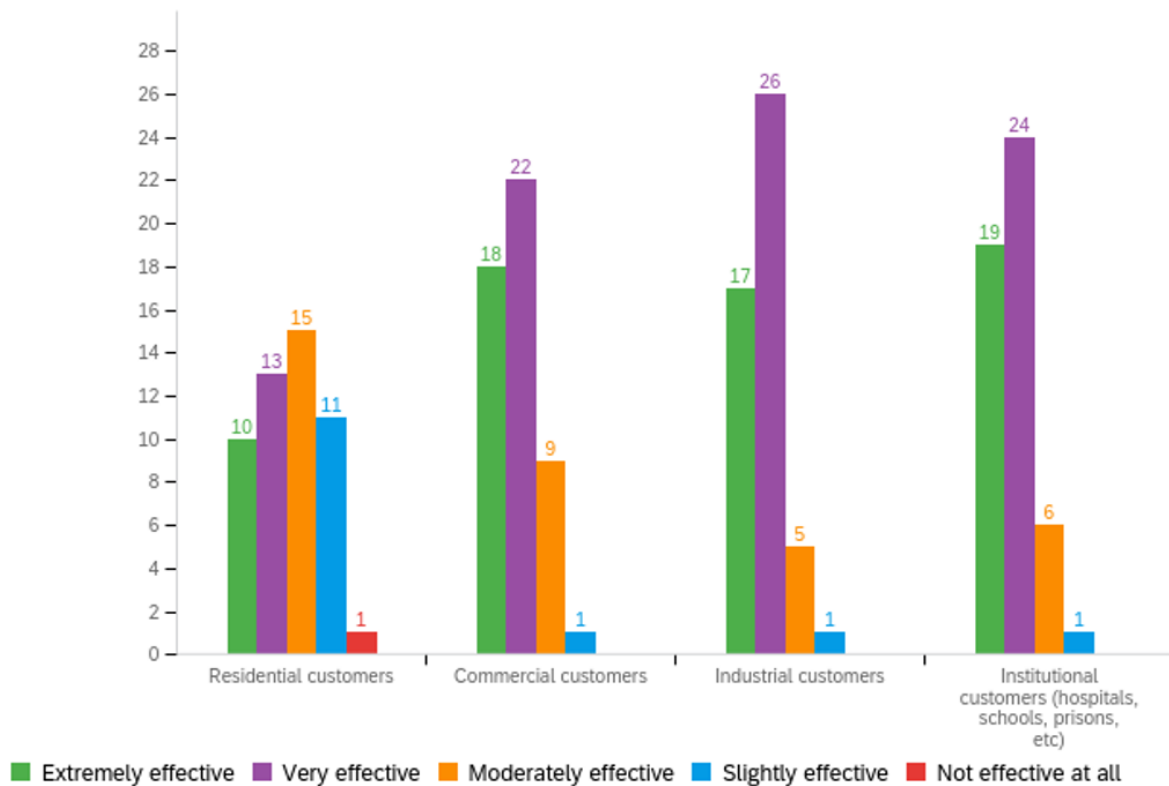
6 - Do you think the current EGLE (Part 14) rules are effective in controlling backflow?

Answer	%	Count
Extremely effective	10.00%	5
Very effective	42.00%	21
Moderately effective	38.00%	19
Slightly effective	8.00%	4
Not effective at all	2.00%	1
Total	100%	50



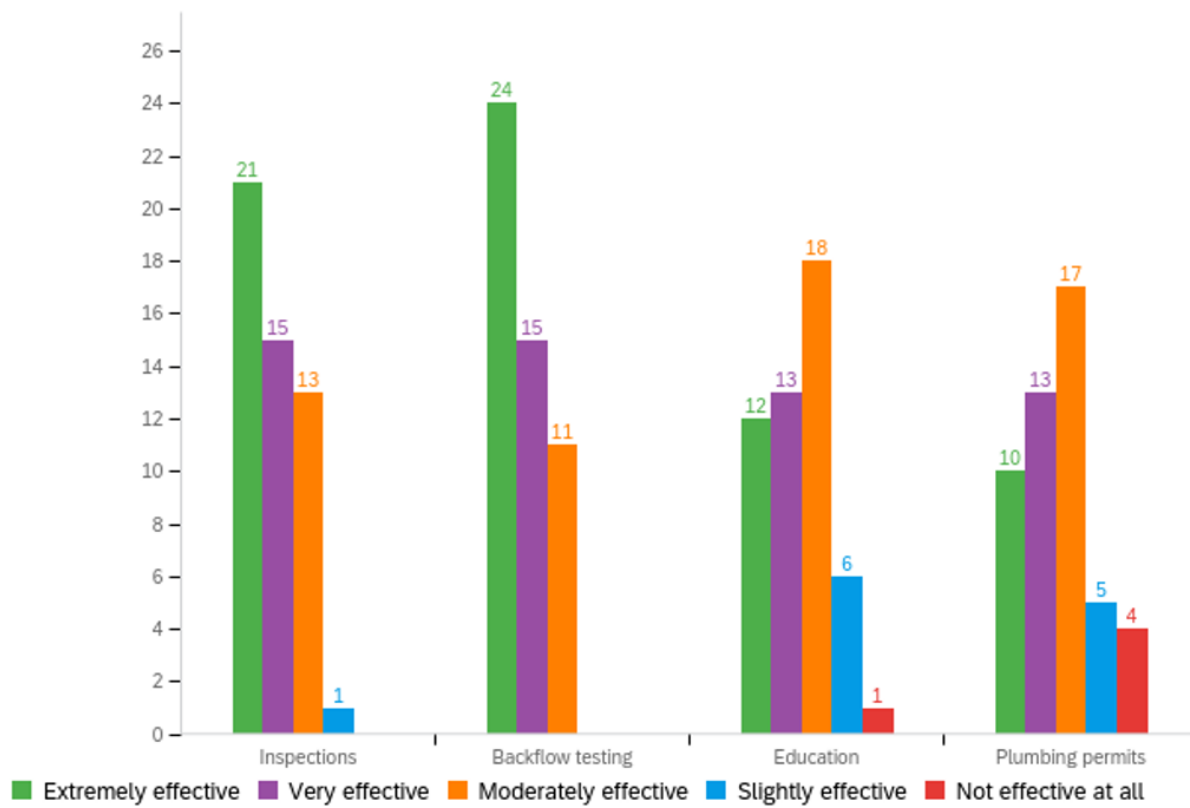
7 - Do you think your local approach is effective in actually identifying and eliminating cross connections as it relates to:

Type of customer	Residential customers	Count	Commercial customers	Count	Industrial customers	Count	Institutional customers (hospitals, schools, prisons, etc)	Count
<i>Extremely effective</i>	20.00%	10	36.00%	18	34.69%	17	38.00%	19
<i>Very effective</i>	26.00%	13	44.00%	22	53.06%	26	48.00%	24
<i>Moderately effective</i>	30.00%	15	18.00%	9	10.20%	5	12.00%	6
<i>Slightly effective</i>	22.00%	11	2.00%	1	2.04%	1	2.00%	1
<i>Not effective at all</i>	2.00%	1	0.00%	0	0.00%	0	0.00%	0
Total	Total	50	Total	50	Total	49	Total	50



8 - Please rate how each element of your cross connection program impacts the goal of backflow prevention.

Elements	Inspections	Count	Backflow testing	Count	Education	Count	Plumbing permits	Count
<i>Extremely effective</i>	42.00%	21	48.00%	24	24.00%	12	20.41%	10
<i>Very effective</i>	30.00%	15	30.00%	15	26.00%	13	26.53%	13
<i>Moderately effective</i>	26.00%	13	22.00%	11	36.00%	18	34.69%	17
<i>Slightly effective</i>	2.00%	1	0.00%	0	12.00%	6	10.20%	5
<i>Not effective at all</i>	0.00%	0	0.00%	0	2.00%	1	8.16%	4
Total	Total	50	Total	50	Total	50	Total	49



9 - If you could change one thing about the state's cross connection rules, what would it be?

34 entries total, responses are direct quotes from participants

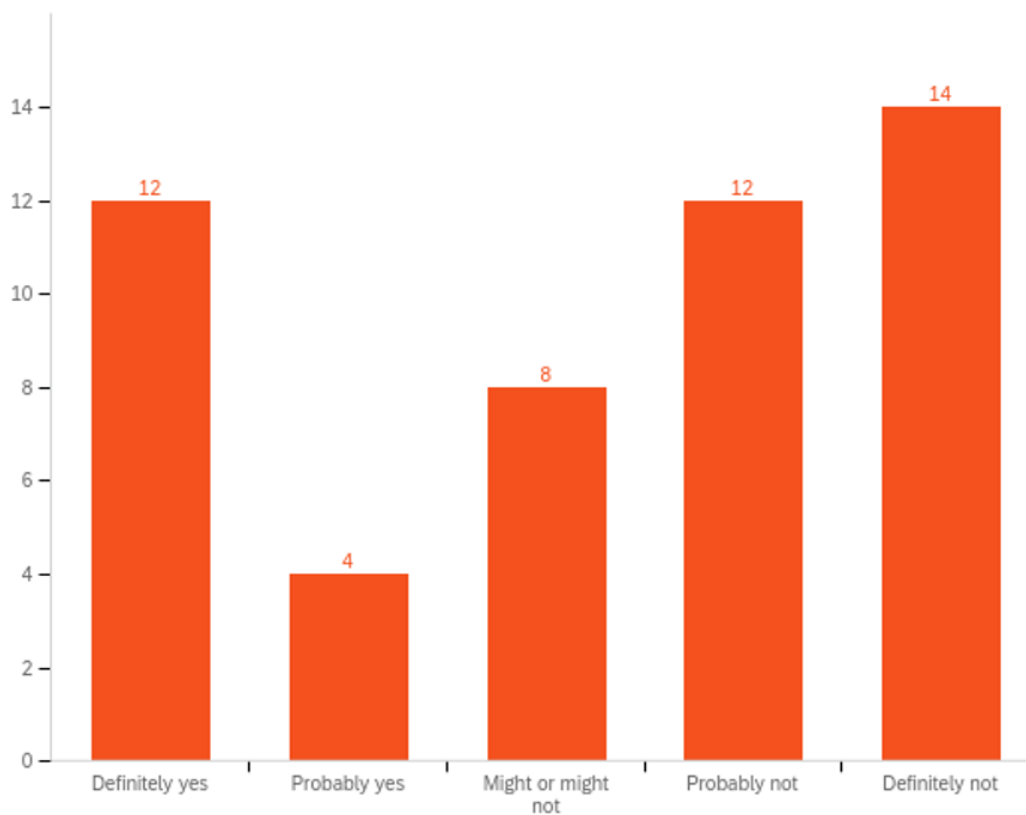
1.	If you could change one thing about the state's cross connection rules, what would it be?
2.	Provide a funding mechanism to better manage the program.
3.	To provide more education to the public.
4.	In a few cases, the rules are vague and open to interpretation. Chapter 7 lists many facilities that require inspections. Phrases like "likely warranted" and "may be needed" leaves the door open for city officials to decide not to spend monies on backflow preventers.
5.	That the residential was watched more closely by the governing partys.
6.	No comment
7.	Ease up on the rules.
8.	A more cost effective way for device testing for the customers. Allow more ways to become a certified tester.
9.	A local cross connection control program should not be permitted to use containment as an acceptable method to prevent backflow. An effective cross connection control program embraces isolation (point of use) backflow prevention throughout the building's entire potable water system.
10.	more enforcement help from EGLE with dealing with the large commercial/public institutions who seem not to care what rules are and pretty much give the local municipality the middle finger when we bring up the subject
11.	Have the state mandate once a year testing on all backflow preventers
12.	REQUIRE ALL PERVEYERS TO TEST AT THE SAME INTERVALS.
13.	Small systems need funding
14.	I would make sure that annual testing is performed on all testable devices.
15.	That there would be more consistency across the state as enforcement is concerned.
16.	There is no consistency in enforcing the current rules by EGLE as they are written. The State's Cross Connection program will lack efficiency and respect until EGLE takes a firmer stance with those supplies that simply see it as an annual check box on their requirements. I personally think EGLE should identify the better CC programs in place in the state and use portions of them to build the ideal program. Size of system should be factored into this program.
17.	It should being driven by community size and make up. It would help smaller communities understand the portion related to them. And should have a citizen website to refer to to educate homeowners that is current and realistic.
18.	Limited personnel inspecting is an issue. Continuous training helps, especially with new employees. High risk testing was every 3 years then moved annually. I would like to have it pushed to 2 years.
19.	Nothing comes to mind...
20.	Let the people that know what they are doing make and enforce the rules without political interference.

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21. State required communication of government entities through standardized information/software. There need's to be greater communication/overlap/cooperation between internal plumbing inspectors, municipal water supplies, cross connection inspection contractors, and fire departments. I believe there are "cracks" in the current system that allow unscrupulous plumbing contractors or individuals to create dangerous cross connections because these organizations are too separated and are not required by law to share information. Even if they take it upon them selves to talk and share information each entity has their own standards for software, rules and state/federal requirements. What would be very helpful is if the State of Michigan was to require information standardization across these different organizations and require these organizations to share information & to work together to address many different problems, one of which would be protecting the public water supply from cross connections. For example, many water distribution operators do not deal with a buildings internal plumbing like a plumbing inspector. Like wise plumbing inspectors do not usually get involved with the public water supply. There seems to be this invisible line that each side rarely crosses. This leads to voids in compliancy that some private plumbers exploit. But if the State was to require plumbing inspectors and the public water supply to communicate (in a standardize method) then there would be overlap which would close this "void". I believe the medical field experienced a similar situation. In years past, each individual hospital/doctor office had their own files, same with pharmacies. This unfortunately caused problems and even deaths to patients and facilitated the improper use of prescription medication. Today, through the use of standardized information protocols and mandated communication, the medical industry has greatly reduced these problems. So maybe we could look to that industry for helpful direction in developing a solution our problems.
 22. Make it consistent from one region to another. We are being told to enforce residential inspections when other communities are not being told that.
 23. Have to state do the inspections on all commercial & industrial properties. Corporations and larger business do not respect local cross connection authority.
 24. The rules are somewhat vague in regard to how to approach inspections, but overall the rules do provide a framework that can be understood by most.
 25. Building owners must take responsibility for their plumbing systems and there must be uniform enforcement in each community
 26. Certified testers to be able to fix backflow devices that fail. At least PVB's. Make it part of the certification program. This would allow more favorable pricing for homeowners who test their PVB's. Some homeowners already feel residential testing is government overreach, then add in pricing from some plumbers to test @ \$125 when it could be \$40.00 or less.
 27. nothing
 28. Eliminate the residential inspections they are to time consuming with limited staff and costly.
 29. Backflow testing and repair - standardized testing requirements in line with other State codes and flexibility in allowing testers to also repair.
 30. The state's cross connection rules are fine as is. I would just recommend that the state apply consistent guidance and enforcement across the state and within districts. Within in our district the water supply WSSN received a deficiency in residential cross connection control in 2020 while the customer supply WSSN did not even receive a recommendation in 2019.
 31. Have the backflow preventer testing interval listed in the safe drinking water act MATCH what is in the plumbing code! This leads to a lot of confusion!
 32. Make a clear program with clear goals. Hold people accountable. This applies to residential only as that is mostly what we cover.
 33. Educating the public on the dangers of cross connections, helping them understand the benefits of the program and explain that no tax dollars are being spent on the private plumbing and irrigation companies that are doing backflow testing.
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34. Enforcement. Other communities that are not abiding by the Safe Water Drinking Act regarding inspecting residential connections need to be fined.

10 - Does the cross connection control program status of a neighboring water system in any way impact your local efforts?

Answer	%	Count
Definitely yes	24.00%	12
Probably yes	8.00%	4
Might or might not	16.00%	8
Probably not	24.00%	12
Definitely not	28.00%	14
Total	100%	50



10a - Please leave any further explanation here.

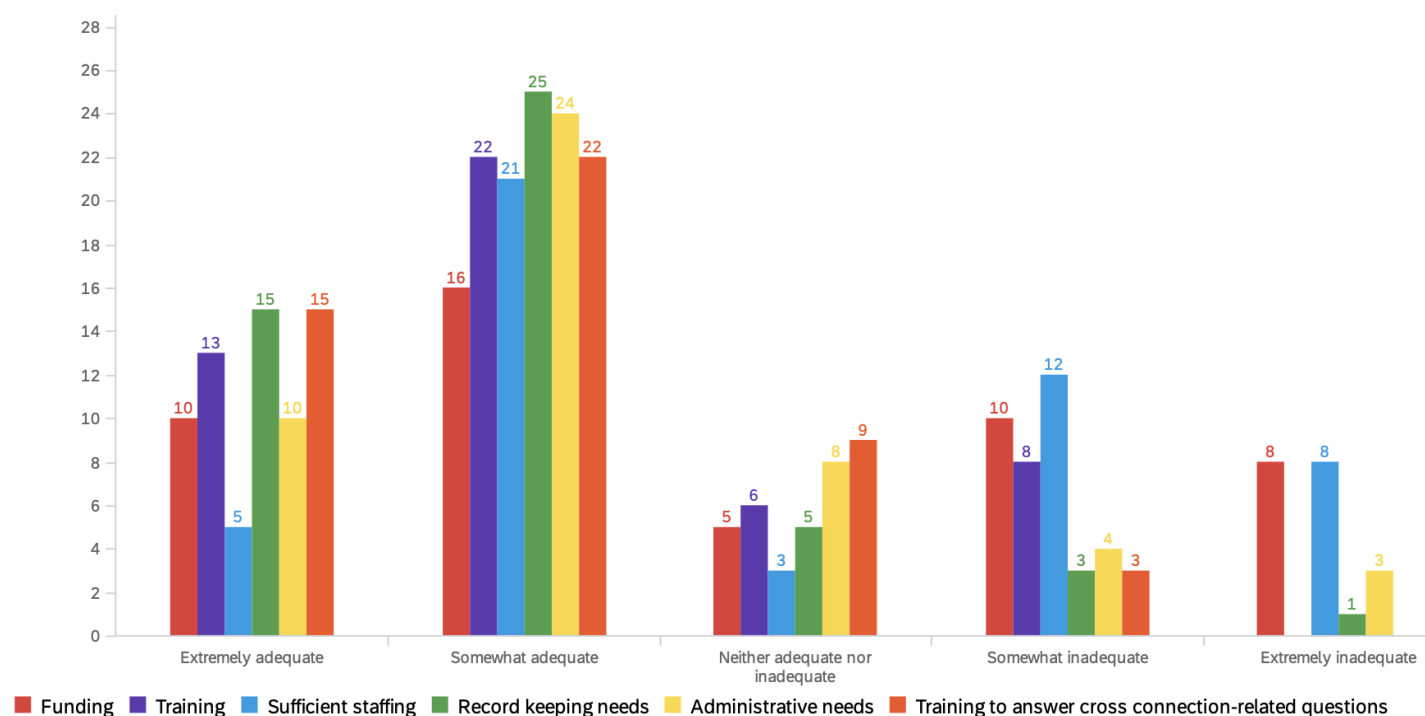
18 entries total, responses are direct quotes from participants

1. Please leave any further explanation here.
2. EGLE is not consistent with enforcement. They are quick to point out shortcomings of very effective cross connection control programs while not requiring other water purveyors to even test residential backflow prevention devices.
3. I have elected officials that talk to friends from neighboring communities that don't inspect their residential customers. This is a challenge explaining to the elected official that EGLE's responsibility is to enforce the Safe Water Drinking Act, not I.
4. IF a customer has other properties there may be disparity between systems on what is being done for inspections and interpretation of the rules.
5. Our neighboring communities require backflow testing on irrigation systems every 3 years, where the City of Saginaw require annual backflow testing testing of irrigation systems.
6. SOME COMMUNITIES DO VERY LITTLE INSPECTIONS AND TESTING AND SOME DO ALOT OF INSPECTIONS AND TESTING. SOME INSPECTORS ARE WELL EDUCATED AND OTHERS ARE NOT.
7. Society's attitude and way of life doesn't stop at a invisible "line" from one municipality to another so the same should hold true for society's attitude toward cross connections and how they jeopardize the safety of the public water supply.
8. Some neighboring communities are not asked to do as much as other communities.
9. Testing frequencies are not the same, some surrounding communities do not even have a residential program which causes confusion to our customers why they have to test residential PVB's and family and friends do not 5 miles away.
10. The required manpower to do this program correctly is not financially feasible.
11. There is always push back from customers when they find out that some other city does less or nothing about backflow testing or cross connection control.
12. We do our own cross connection inspections with customers served on our public water supply. I am not aware how often the neighboring communities do their inspections.
13. We have totally contracted our inspection service out to [Company name ommitted] This makes it easier and up to par.
14. We purchase our water from a larger neighboring system.
15. We take direction from EGLE, not what's happening in neighboring communities. Although, networking with neighboring communities has the possibility to improve your program via sharing positive ideas.
16. When a customer that has property in each system complains about the requirements in our system because the other does not do it and is not held accountable by EGLE, it creates a political situation.
17. Without having uniform enforcement from community to community, good programs will be watered down by politics. If they are not doing it there and there why must we do it here. There are no consequences for having a lacking program.
18. its good to talk to each other and have anothers opinion

11 - We want to know if you have the following resources necessary to effectively carry out your local program. Please rate the adequacy of the following resources for your local program.

Degree of adequacy	Extremely adequate		Somewhat adequate		Neither adequate nor inadequate		Somewhat inadequate		Extremely inadequate		Total
Funding	20.41%	10	32.65%	16	10.20%	5	20.41%	10	16.33%	8	49
Training	26.53%	13	44.90%	22	12.24%	6	16.33%	8	0.00%	0	49
Sufficient staffing	10.20%	5	42.86%	21	6.12%	3	24.49%	12	16.33%	8	49
Record keeping needs	30.61%	15	51.02%	25	10.20%	5	6.12%	3	2.04%	1	49
Administrative needs	20.41%	10	48.98%	24	16.33%	8	8.16%	4	6.12%	3	49
Training to answer cross connection related questions	30.61%	15	44.90%	22	18.37%	9	6.12%	3	0.00%	0	49

"Somewhat adequate" accounted for the majority across all resource options given. Responses for



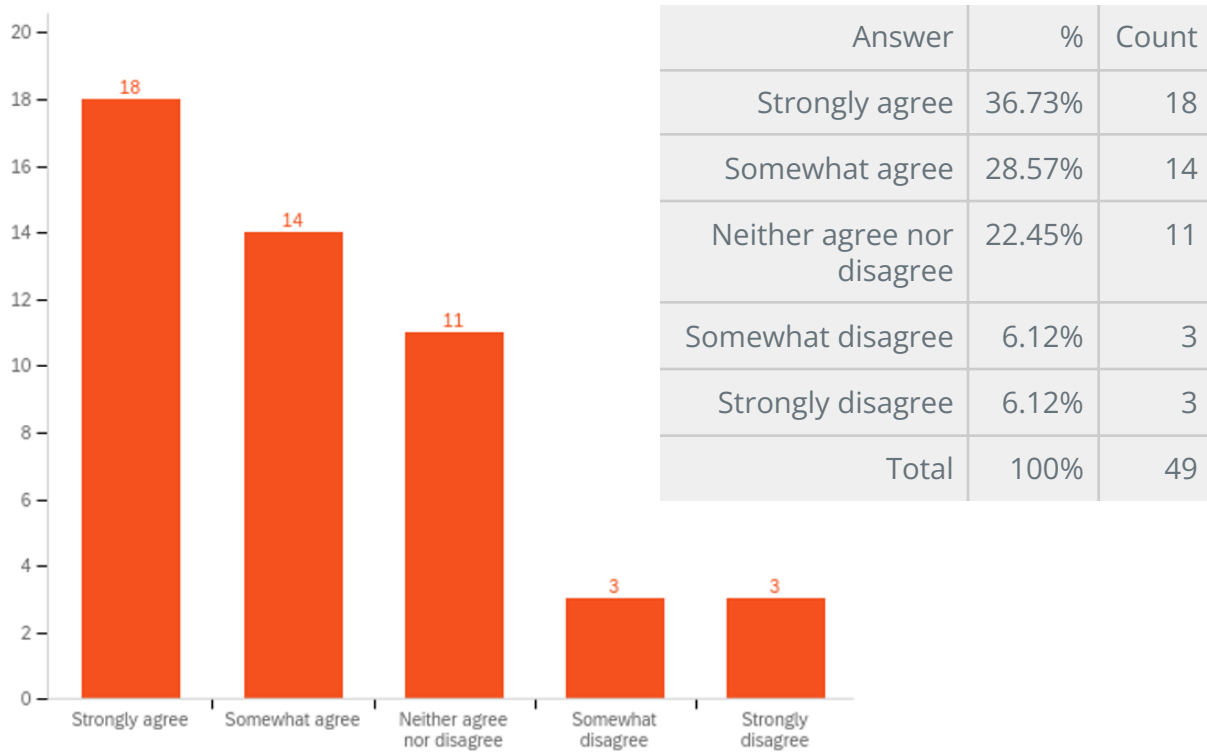
"Somewhat inadequate" and "Extremely inadequate" were highest among sufficient staffing and funding.

11a - Are there other resources not listed above that you would like to give feedback on? Please leave any further feedback on accessibility, complications, etc. as it relates to the above.

12 entries total, responses are direct quotes from participants

1. Are there other resources not listed above that you would like to give feedback on? Please leave any further feedback on accessibility, complications, etc. as it relates to the above.
2. I believe one of the biggest areas of improvement that EGLE could make is to hire employees that have practical field experience in their area of enforcement. Most of the regulators at EGLE have no practical field experience, which makes it difficult to be able to count on them for support when they lack knowledge and field experience.
3. The cost to our city is very costly
4. With increasing requirements from unfunded mandates, staffing is being stretched very thin to carry out the requirements.
5. Guide book for reference with up to date pictures and real world explanations
6. Many questions are answered with assistance from MRWA and EGLE.
7. Law enforcement is not interested in pursuing cases of cross connections, which are misdemeanors, and falsifying backflow reports, which are felonies. Administrations seem more interested in whether customers keep their grass cut than they are in protecting the water supply.
8. State needs to create harsher penalties for those who willfully violate plumbing laws and revoke plumbing license for those who are repeat offenders. The state also needs to push local prosecutors to after those who violate these laws. I know there are currently many law on the books but many are not aggressive enough and/or local prosecutors are reluctant to go after professional plumbers who willfully violate the plumbing laws. Many prosecutors don't understand (nor do they want to know) how serious it is to the public when a public water supply is or could be contaminated by a cross connection.
9. The State currently has no training requirements for personnel in the cross connection control field. I have signed up for ASSE 5150 Administration Certification and ASSE 5120 Surveyor Certification. Because there is no State mandate for training there is not enough students to have the class and they are cancelled each year.
10. Tons of training available and regulatory information is consistently shared and updated. I strongly encourage to start concentrating on providing solutions for regulatory updates. The water industry is consistently improving regulations but municipalities are short handed and overwhelmed and feel there is no way they can comply with current staffing. If solutions/ideas of how other communities have figured out how to streamline the process it or EGLE offer a few solutions on how to comply would help other communities. It is easy to tell anyone to do anything but offering a solution along with expectations of regulatory compliance requirements would not only gain confidence of water suppliers that EGLE knows what they are doing but also gives municipalities the option to succeed.
11. Need more state funding for programs.
12. The licensee database maintained by the ASSE does not provide adequate contact information. The same is true for licensees in LARA's database when it comes to plumbers. If we have a problematic tester, it can be difficult to track them or even contact them. Also, we need clear and concise direction from the ASSE on what evidence needs to be collected in order to get a problematic tester's ASSE 5110 license revoked.

12 - Water system decision makers (i.e. community officials in position of authority) support active enforcement of my local cross connection program.



13 - What is your opinion of EGLE's Cross Connection Control Rules Manual?

Field	<i>Useful</i>	<i>Confusing</i>	<i>Outdated</i>	<i>Necessary</i>
Minimum	0.00	0.00	0.00	1.00
Maximum	100.00	100.00	100.00	100.00
Mean	70.36	50.22	51.11	88.81
Count	50	46	45	48

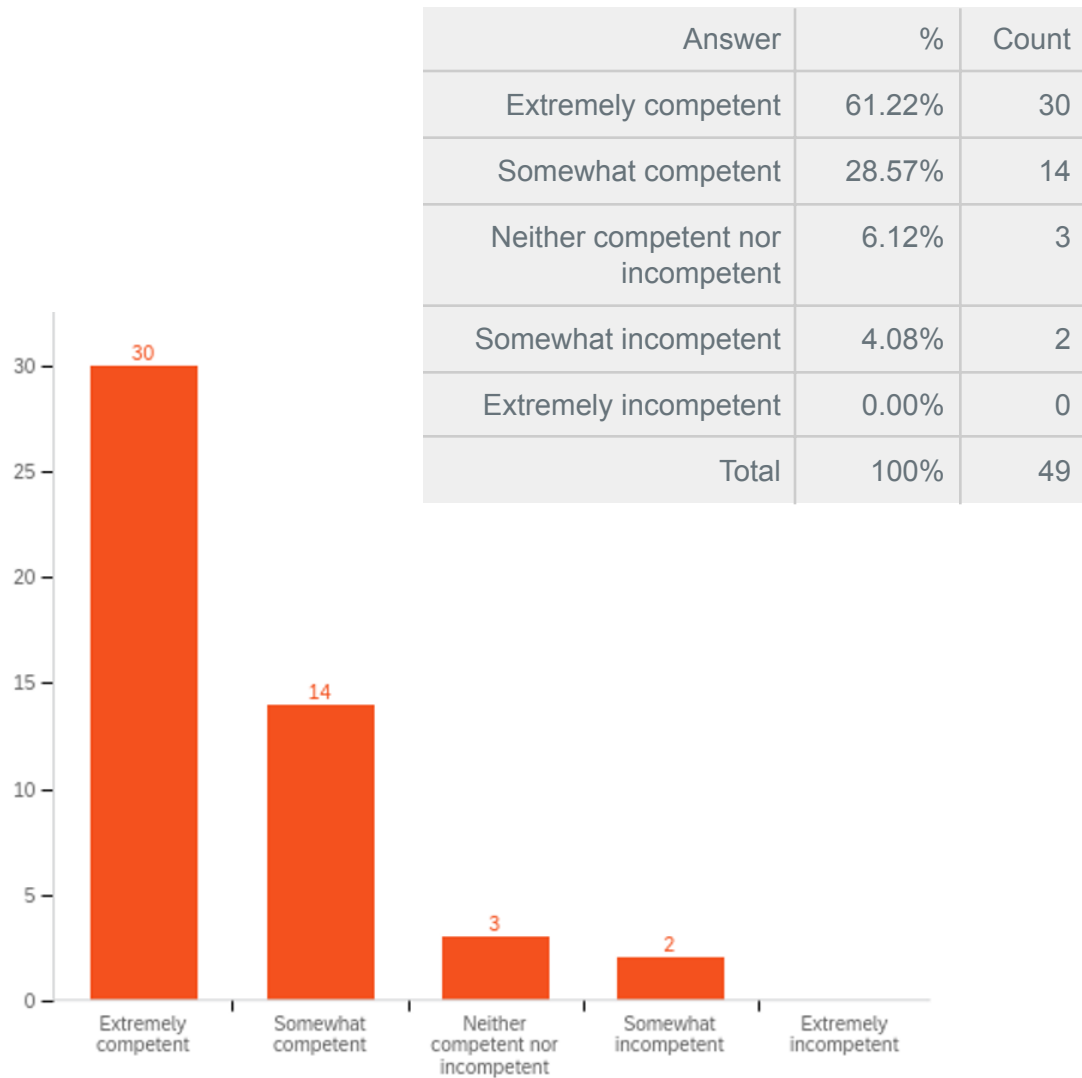
**numeric values on a scale of 0-100 (0 being negative and 100 being positive)*

13a - Please leave any further feedback related to the Rules Manual.

13 entries total, responses are direct quotes from participants

1. Please leave any further feedback related to the Rules Manual.
2. The rules manual covers that necessary topics. The manual could be updated with better graphics and explanations on tester requirements, approved device listings (difficult as they change) and graphics.
3. The manual is a very good tool for individuals who do not have a comprehensive background in plumbing.
4. THE RULES SHOULD BE UPDATED EVERY 5 YEARS MINIMUM
5. It needs to be updated to reflect the changes the state wants enforced.
6. I have been using the same manual for the past 13 years. I am not sure if items in the manual need updating but it would be nice to know if things have changed. Currently using the 2008 edition.
7. The Name implies everything in the manual are rules, which they are not. Only the Part 14 Rules included in the manual are actual rules. Some of the information is incorrect, inconsistent, and outdated.
8. The manual is not the problem, the problem is consistent enforcement and oversight by EGLE.
9. Because the Rules Manual was never updated during the 2015 Rule amendments, there are conflicts between the rules and codes now referenced. It's useful as a guide to start a program. The conflicts create problems for me and confusion when having to explain. It needs to be updated or removed.
10. The current manual I believe is from 2008 and last I heard it actually is only a guideline and cant be enforced because it was never officially voted on. The manual should be updated at least every 3-5 years. It is a little embarrassing the latest copy is from 2008 and so much has changed over the last 13 years.
11. EGLE staff should be able to understand it before enforcing it.
12. A 5th edition would be nice but not until the SDWA backflow preventer testing interval matches the one in the plumbing code. Also, it would be helpful if the EGLE would give us a clear definition of what constitutes an inspection and what qualifies a water account from being exempt from routine inspections.
13. No clear rules for residential.

14 - How competent are your cross connection control staff in reviewing test report forms to verify the test is valid with regard to procedures, tester credentials, assembly ID, etc.?

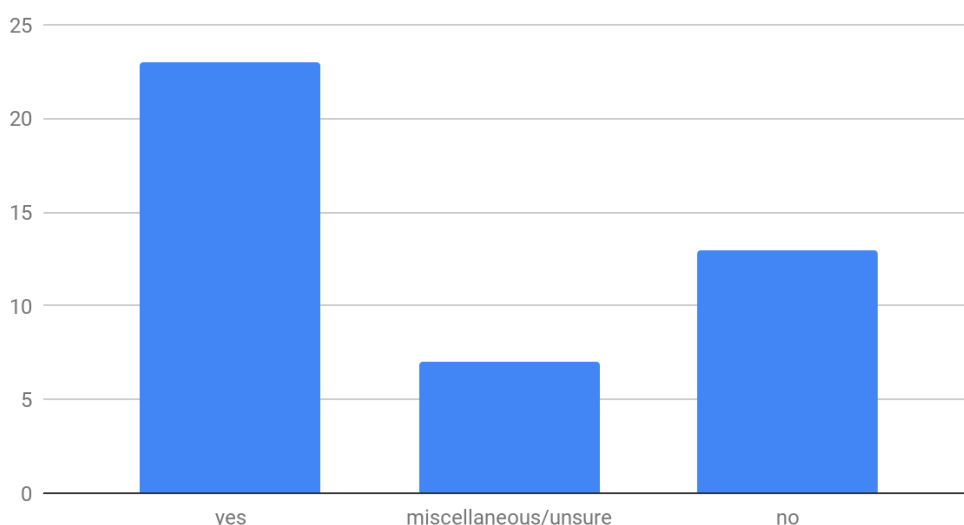


15 - Do you believe there are enough checks and balances in place to ensure dishonest or incompetent testing practices are identified and corrected?

43 entries total, responses are direct quotes from participants

**one word "yes" and "no" responses are omitted from text below for length*

Water system personnel: general response to Q15



1. probably not. Nor is there enough time.
2. Yes, I believe our contractor is capable of auditing testers results.
3. Yes our program has all the checks and balances built into the STEM and SMART software.
4. Testing is conducted by reputable qualified licensed plumbers in our area and reporting is verified by our cross connection control outsource firm. For these reasons I don't think we have a problem.
5. THE NEW ASSE TESTING CERTIFICATION HAS MADE A MAJOR DIFFERENCE IN QUALITY TESTING.
6. Not sure but doubtful there are enough because of lack of overlap between different governmental agencies.
7. No. I still see test reports that are incomplete, a failed test based on the supplied values (despite being marked as passing), and/or the wrong test form being used for the given assembly. I find that these issues are often blamed on clerical staff which does not fix the problem(s).

-
8. No sure. When I receive the reports I am using the testers word that the test was completed as required.
 9. No I do not. The State needs to be involved in this process and currently they are not. We have testers that know nothing about codes or installation instructions which is necessary for part of the testing process. The testing standard does not recognize other State Laws such as the skilled trades act P.A. 407 for licensing requirements.
 10. New construction installing backflow preventers and making sure they are tested and reported to the local water supplier could be improved. Plumbing code and the manual need to also align. Installation of PVB's and testing need to match in both the plumbing code and manual. Currently they do not!
 11. I think so because there is still a physical inspection by our staff and if a preventer is bypassed or leaking they will definitely notice.
 12. I believe they exist but are probably not effective.
 13. I believe there are enough.
 14. Hand written and signed test forms are by far the most effective tool available to control submission of fraudulent backflow test forms.
 15. For systems that have staff in place, yes. For systems that contract out their Cross Connection program, no. We have been approached numerous times over the years about contracting out our program only to find the level of service is half of what we currently provide. I simply do not trust for profit CC programs.
 16. Do not know.
 17. Definitely not! I believe that there are many "drive by" tests being done. However, there is no support for us to go after suspected violators.
 18. Absolutely not. Possible dishonest and incompetent testing practices (and illegal reporting) are routinely identified by staff and ignored by the administration.
-

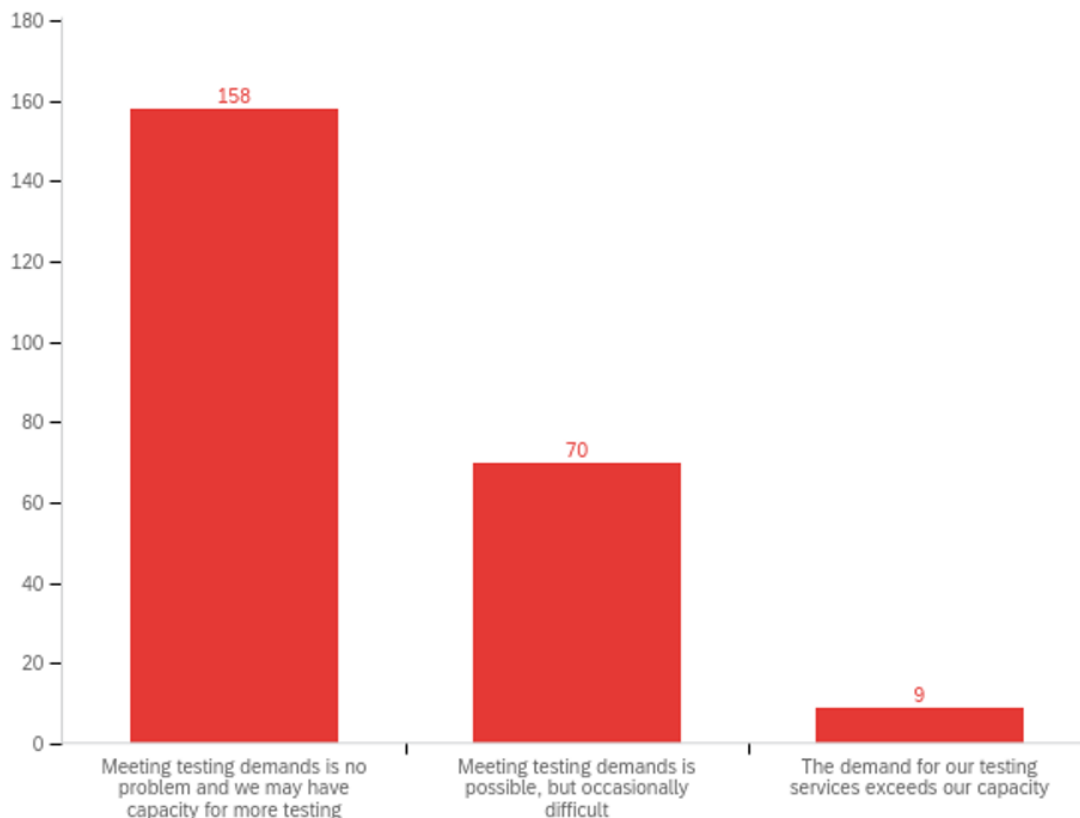
Survey Data (continued)

Testers (9 questions total)

Report generated August 23rd 2021, 3:45 pm EDT

1 - Please choose the most accurate statement. How would you rate your or your company's ability to meet the demand for testing customer backflow preventers?

Answer	%	Count
Meeting testing demands is no problem and we may have capacity for more testing	66.67%	158
Meeting testing demands is possible, but occasionally difficult	29.54%	70
The demand for our testing services exceeds our capacity	3.80%	9
Total	100%	237

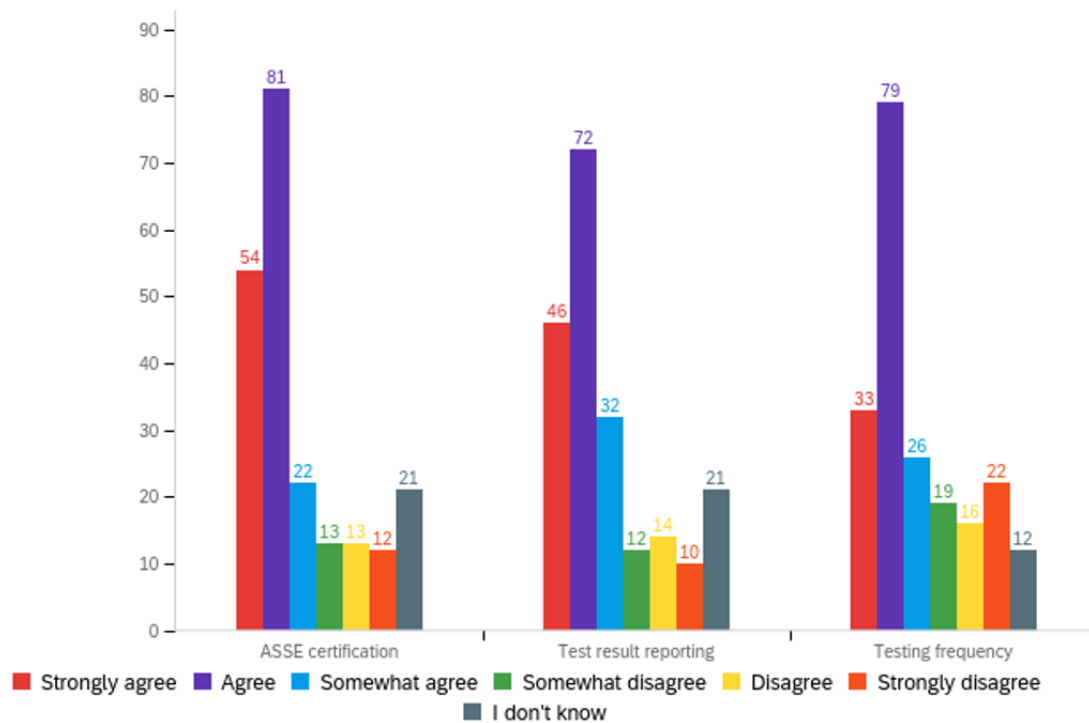


2 - In your experience, are testing requirements enforced consistently across the various jurisdictions you work with respect to ASSE certification, test results reporting, and testing frequency?

ASSE (American Society of Sanitary Engineers) certification: I see evidence that the local water purveyors in my region consistently verify that testers are ASSE certified and reject test results from noncertified testers.

Test result reporting: I see evidence that the local water purveyors consistently read/understand test reports, and evidence that they consistently reject false or incomplete testing forms.

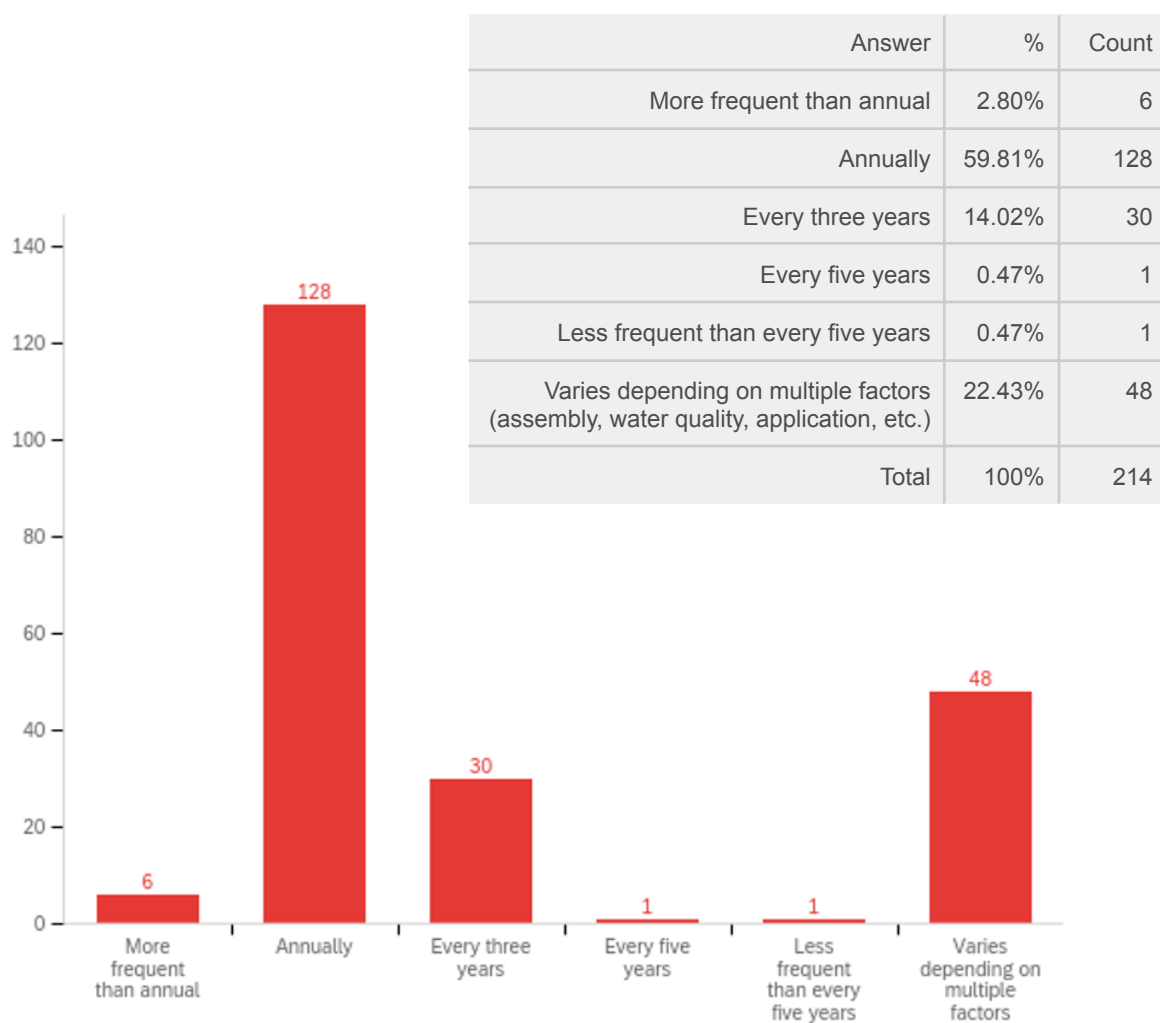
Testing frequency: I see evidence that water purveyors in my region consistently require testing of backflow preventers on similar frequencies.



Elements	ASSE certification		Test result reporting		Testing frequency	
<i>Strongly agree</i>	25.00%	54	22.22%	46	15.94%	33
<i>Agree</i>	37.50%	81	34.78%	72	38.16%	79
<i>Somewhat agree</i>	10.19%	22	15.46%	32	12.56%	26
<i>Somewhat disagree</i>	6.02%	13	5.80%	12	9.18%	19

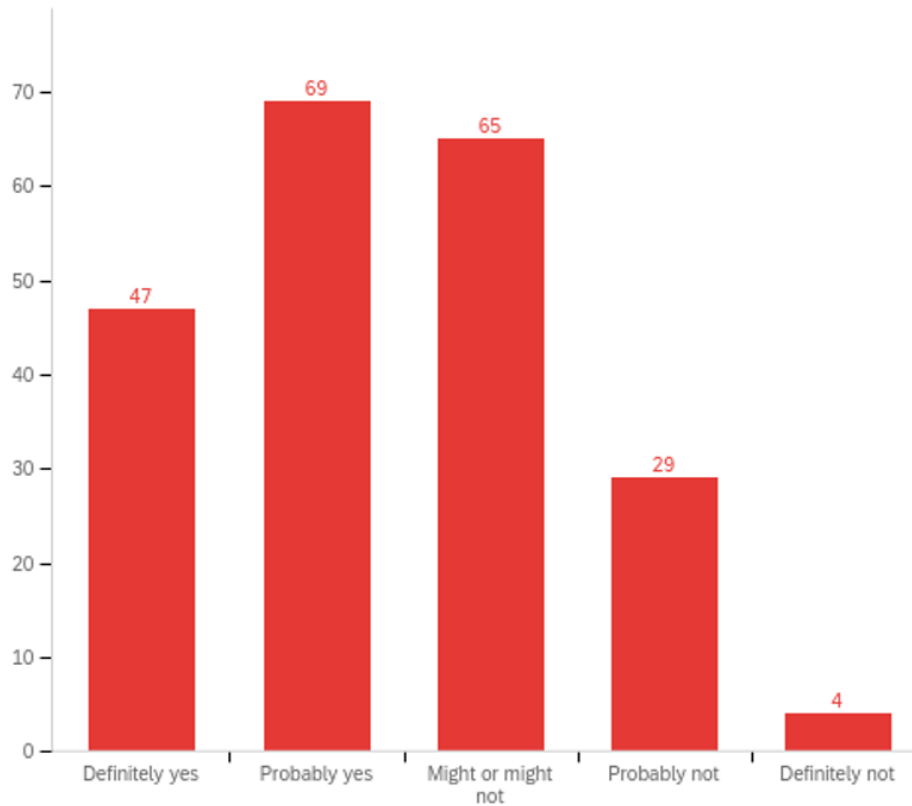
<i>Disagree</i>	6.02%	13	6.76%	14	7.73%	16
<i>Strongly disagree</i>	5.56%	12	4.83%	10	10.63%	22
<i>I don't know</i>	9.72%	21	10.14%	21	5.80%	12
Total	Total	216	Total	207	Total	207

3 - Based on the results of your testing, what testing frequency do you feel is necessary to ensure backflow prevention assemblies are in good working order?



4 - The majority of my customers trust that the purpose of testing their assemblies is to protect public health.

Answer	%	Count
Definitely yes	21.96%	47
Probably yes	32.24%	69
Might or might not	30.37%	65
Probably not	13.55%	29
Definitely not	1.87%	4
Total	100%	214

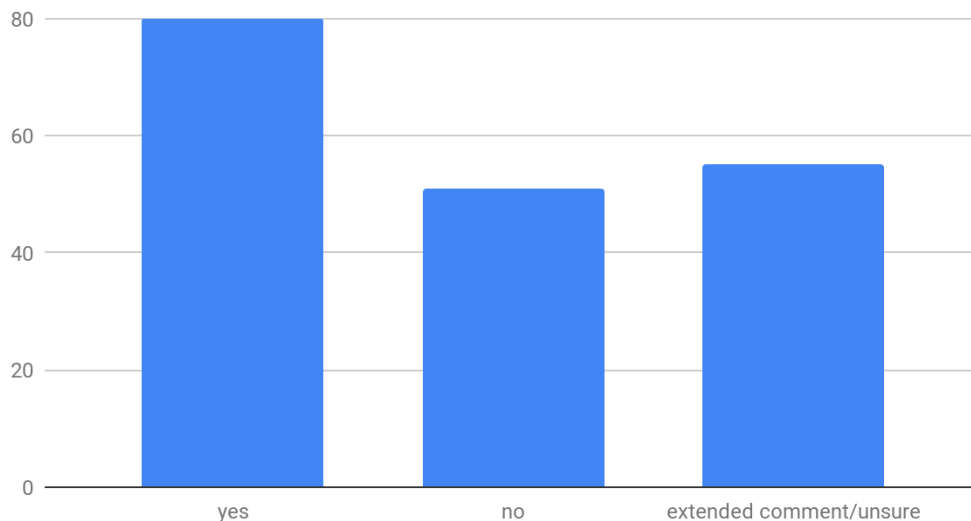


5 - In Michigan, do you believe there are enough checks and balances in place to ensure dishonest or incompetent testing practices are identified and corrected?

186 entries total, responses are direct quotes from participants

*one word "yes" and "no" responses are omitted from text below for length

Testers: general response to Q5



1. Somewhat... in west Michigan some municipalities comply with having a program and others do not, [Community name omitted] does not even have a residential program so I find it difficult to believe any person in charge who doesn't even believe in a residential program really takes the time to make sure the tests are done correctly or at all.
2. With the current training, I believe so, yes
3. no opinion
4. ????
5. No. The variation in oversight is very inconsistent across the board. Some jurisdictions take the testing and reporting very seriously, while others seem to view it as a pain that they do not want to deal with.
6. Yes I agree
7. In some municipalities, yes. I believe it is easy to defraud the system however. And when dishonest testers are caught, there aren't really any repercussions.
8. Not sure
9. Hard to enforce the compliances
10. You are going by the testers performance.
11. Yes, very much

-
12. Yes a device can pass on one test and you can turn around and test it a day later and it might fail they are mechanical devices and prone to failure. Especially after they have aged over 10 years. Here in michigan we have several challenges for these devices they have to be winterized and they're exposed to chlorine in the water which are both hard on a devices for residential irrigation.
 13. We have a good system in place but there is room for improvement.
 14. Yes I do.
 15. NA
 16. No. I know there are contractors or test it from the front seat of our truck. Not the case with my company.
 17. I don't know
 18. I think so
 19. I work at a government hospital and management should do a better job but they have tied my hands .
 20. yes I do
 21. Somewhat, but when dishonest testing is found there is question as to where that needs to be reported and what, if any, follow up by the State is taken.
 22. Yes I do
 23. Not sure
 24. It's hard to judge testers that I do not know. I would hope all testers have the integrity required to perform the tests accurately.
 25. Not sure, but i have heard inspectors say that they have identified certain companies that are not doing a thorough job.
 26. I would like to think so but, from the experience I have and where I do my testing, I couldn't say.
 27. don't know
 28. Yes, the testing certification is difficult enough to push the correct testing methods and recording.
 29. Not sure
 30. No, because not all cities are requiring testing
 31. Not on our region of high water tables and frequent loss of system pressures.
 32. Yes having to recertify every three years helps to make sure the testers know what to do .
 33. No, but now with asse testing it makes people more honest and better qualified testers
 34. Not at all
 35. Not at all. The incompetence has been Is exasperated by the illegal installation by sprinkler companies, they are not educated on correct applications or implementation.
 36. Somewhat. The recertification time frames and the available classes meet expectations. I also feel if backflow testing is not tracked and enforced it is hard to gauge the accuracy of the testing. I have been in entire subdivision, all with PVB for irrigation, and no one has had them tested in over 5 years because
-

they are not aware of what they are let alone what they do. Public health education on what backflow assemblies, devices and methods do would boost testing demands, but I feel it would also give a better picture of testing accuracy and frequency.

37. I believe so but no way to check

38. Some places more than others

39. I believe so

40. I do not. Not sure what prevents someone from having a unqualified employee testing, or drive by testing.

41. Too many.

42. Don't know.

43. Not at this time, especially at the state level

44. Yes. We utilize a reporting structure and their requirements are stringent. However, lawncare/landscape contractors or unlicensed contractors/handymen are a concern.

45. Yes the asse requirements have been a game changer

46. Resources would be better spent identifying that all potential contamination sources are identified and protected with a backflow. I am more interested in protecting my water than you are. I am also more trustworthy than you are. [Community name omitted]. I spent a lot of money, 40 hours, and passed a lengthy test to be able to test a backflow, and I feel better about my wife, kids, and neighbors drinking the water as a result. I make the same amount on a passed test as I do on a failed test.

47. Yes I do.

48. Yes it depends on the person reading the test reports. I don't like [company name omitted] they never seem to have their stuff together.

49. No, I believe a tester should be a licensed plumber or at least in the employment of a licensed plumbing business.

50. Somewhat

51. NO. From the perspective of someone who takes backflow testing very seriously and goes to great lengths to insure my customers are getting what they paid for while performing my duty as a certified tester, there are those that routinely "fudge" their reports.

52. We believe so, we work to ensure that our equipment is calibrated, our testing practices are accurate and forms filled out completely, we assume the other companies are doing the same.

53. No I do not think so a lot of irrigation company's are installing brand new PVC and not pulling permits or testing at time of installation nobody is enforcing that and I believe a lot of cross contamination with chemicals, pesticides, fertilizers applied can be very harmful. I have come across many installed and the local municipalities don't have a clue I test them and send results in and it may or may not get added. Or I get a call wanting to know who installed it. I don't think that's my responsibility to report that.

54. I believe the program could use some added support to ensure the integrity of the program is being achieved

55. I think we are on the right track. Some of the smaller towns need to adopt/ enforce the ASSE requirements

56. I do not

-
57. I think the MMPA handled it better than ASSE. I tested for 30 years before being required to take the ASSE course. I have several plumbers that work for me that have had to certify with ASSE approved course. The training is cumbersome and sometimes confusing. The techs get hung up on the process rather than understanding how the valve is supposed to work.
-
58. Yes - but it's up to the communities for take action against certified testers who submit passing test results when the device clearly wasn't working correctly. I came across an irrigation assembly that passed by a tester 3 years prior but when i tested it the assembly failed. The spring inside was installed upside down 3 years ago, there was no way that it passed. Every community does require proof of ASSE certification and testing device calibration.
-
59. that only license plumbers to touch devices
-
60. I think they do well at checking things out clerically, which covers incompetence. On the other hand I'm not sure you can put enough checks and balances on a person if they are determined to be dishonest. Which is why I believe in having either a Plumbing or Mechanical contractor license as a prerequisite to becoming ASSE certified as a tester.
-
61. No sure
-
62. Absolutely not. Municipalities and the state do nothing to correct incompetent testers or prosecute the often illegal practices by some testers. The unscrupulous testers know this and take advantage of it; often underbidding legitimate testers to make a volume profit. Some testers pass assemblies that should obviously fail. Some testers replace assemblies that could be easily repaired. Some do not even test and just turn in passed test reports.
-
63. I think so.
-
64. We have hundreds of devices installed that have never been tested on camus. Management does not understand why a annual test is needed and only care about labor cost. They are not concerned with safe drinking water.
-
65. Yes I do
-
66. No. the dishonesty part is hard to correct. People don't want to spend the extra money to see if something was dishonest or not. They just pay to have devices fixed rather than retested by someone else.
-
67. Yes, ASSE testing removed a lot of the testers.
-
68. Need more checks on building
-
69. No I do not believe we have enough. Additionally, I do not believe (some) the outside reporting agencies are supportive of the licensed testers and even steer customers to do things on their own - with costs - makes no sence. I know of some that work with Irrigation companies - with non-licensed techs to install devices.... dont understand how that is happening either. We have been doing this for awhile now - I have 3 ASSE Certified Testers - 2 Master Plumbers and 1 Journeyman Plumber. We may have insight to offer.
-
70. If I were to perform "drive-by" testing who would know? I do feel the importance of good testing continues to grow and that's good. Not sure how to include true checks and balances but I'm in favor of it.
-
71. No really
-
72. No, I am aware of individuals who do not properly test or test at all and submit passed test results. These same individuals never submit failed test results. There is nothing anyone can do to combat the issue.
-

-
73. No. There are times we come behind another company to test or to make a repair on an assembly that the other company failed. Regularly find assemblies that fail, even though marked passed, and vice versa.
-
74. Absolutely not, faulty testers have been reported multiple times with zero support from the state to reprimand them.
-
75. I have no idea.
-
76. Probably not. I don't know of any checks on testers.
-
77. Not sure
-
78. Absolutely not. I have come across devices that are not testable, for instance. One which was missing the #1 shut off and both #1 & #2 test ports, been in service for 12 years, has a City APPROVED sticker affixed to the body of the DCV, and when reported to AHJ nothing occurs. (for instance) How many approved test reports have been generated for this device? How did the City Approve this installation? Why did I have to follow up with AHJ several months later to find out nothing had been done?
-
79. Once a test result is turned in it is filed away and forgotten until next required test. I don't see anyone checking or verifying that a test turned in was tested correctly or tested at all.
-
80. No. One facility (Municipal WWTP) had more than half of their assemblies fail. It was obvious the previous tester had been rubber stamping them over the years, as they were shocked that I'd have to turn the water off to test. I also found several assemblies that had been steadily failing to the point that diversion channels were installed to carry the water away. There was nobody that oversaw this plumber. They just took his word for it.
-
81. I think we have a good start but like a lot of governed programs the focus isn't necessarily where it should be.
-
82. Some municipalities such as [name omitted], [name omitted], and [name omitted] require licensed plumbers to perform testing. In my experience, I have seen many devices NOT in compliance with standards and manufacturers requirements, although having been recently tagged as "Approved" by plumbing firms. I find these requirements therefore arbitrary and capricious, and testing should be opened to ASSE certified testers.
-
83. No, there does not seem to be a central enforcement agency that bad testers can be reported to.
-
84. Absolutely not! The water purveyors I know do not have support from their superiors to report testers to ASSE and have their certifications revoked. A few can ban bad testers from their communities but they test in neighboring communities endangering public health. They charge much lower rates because they do drive by tests or pass failed devices making it difficult for the honest testers. Worse yet many communities don't care about the quality of their programs.
-
85. I do not think so. They pretty much accept results and check certifications but seems like there's plenty of room for errors.
-
86. I don't have enough data to make this decision
-
87. 1. There is little to no way to keep the dishonest testers from submitting false results. There should be an audit of the assemblies tested. Cheap testing companies regularly certify units that are bad. 2. Many municipalities do not have the resources to regulate residential testing. 3. In the commercial setting, due to the high cost of repairs, there is an incentive to hire a "cheap" company to test a unit that was marked failed. It is difficult, if not impossible, with the current setup to stop this. I've failed numerous assemblies that are still in place years later as the owners found companies that will certify them regardless.
-
88. Yes, I think so
-

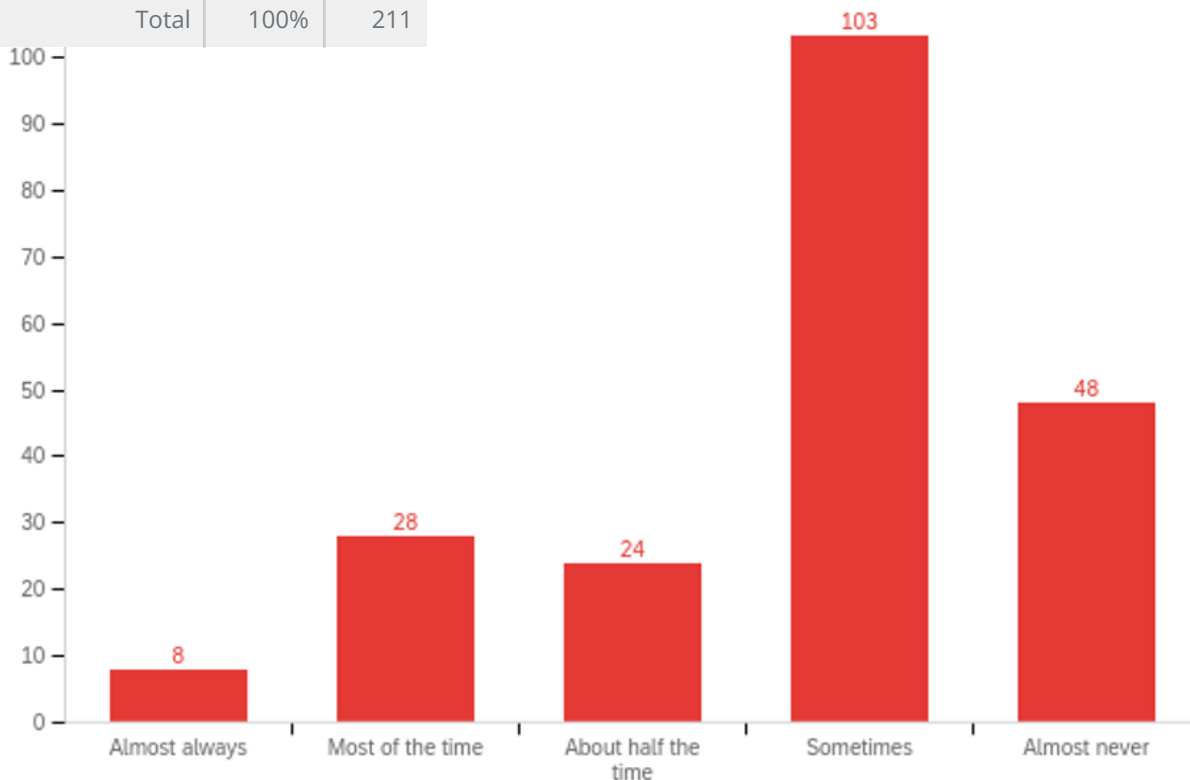
89. I believe that the municipalities in the Greater Grand Rapids area maintain a high level of checks and balances. Each year I must provide copies of the licenses and test gauge certifications for each of my servicemen, as well as copies of their plumbing licenses. If I do not have them submitted on time, the inspectors will call to notify me that they are missing the documentation.

90. I have had customers who understand and we have some that think its just another way to suck money out of them.

91. not honestly sure

6 - How often do you see evidence of backflow preventers being repaired or installed by non-licensed plumbers?

Answer	%	Count
Almost always	3.79%	8
Most of the time	13.27%	28
About half the time	11.37%	24
Sometimes	48.82%	103
Almost never	22.75%	48
Total	100%	211



7 - If you could change one thing to better ensure backflow preventers are in good working order, what would it be?

152 entries total, responses are direct quotes from participants

1.	If you could change one thing to better ensure backflow preventers are in good working order, what would it be?
2.	Demand that municipalities conform to one set of rules and testing frequency. Backflow devices regularly need repairs and need to be tested annually.
3.	The state of michigan literally enforces nothing regarding plumbing unless it's profitable. Calling the state regarding a disagreement with a local inspector goes no where. Asse certification is a joke as well, just more money for the interested parties. Quite sad really.
4.	Reduce cost of becoming certified
5.	no opinion
6.	Don't know
7.	Ensure proper people are installing and recording information on new back flow devices
8.	Uniform compliance
9.	use proper backflow preventer for the application
10.	Allow people who are not plumbers to become certified to do repairs 5130 certification. This is really true in the irrigation sector.
11.	Annual testing consistently enforced so neighbors across the street from each other (but in different cities) don't have different requirements.
12.	We desperately need a public campaign, educating water users of how backflow occurs, and the importance of preventing it. The AHJ may enforce periodic testing but doesn't explain why. Therefore the water consumers think this is another form of government intrusion and try to find a way to work around the system. Everyone knows that we should protect our lakes and streams. It seems nobody understands the concept of protecting the drinking water supply.
13.	make it mandatory that anyone installing, testing or repairing be a licensed Plumber with ASSE certifications
14.	Homowenens knowledge of the system Utube video would be nice
15.	Stop requiring certification every three years, more tester= more tested devices. It isn't hard, this is just a money grab.
16.	n/a
17.	I believe leave well enough alone if the valve is good and you can see the tag leave it alone
18.	Test commercial annually and residential every three years
19.	More direction regarding location and accessibility for installers
20.	To increase testing is the only way to ensure that they're in good are working order. Legislators are apprehensive for residential testing because of pushback.

21. Better regulation in all jurisdictions. I believe there are still a lot of citys and townships that are not thoroughly testing.
22. A plumbing permit to install any assembly.
23. More enforcement of rules and regulations
24. NA
25. Better pipe insulation
26. Stricter enforcement of the current regulations and a state legislature that is not trying to reduce the testing for their wealthy benefactors. It should be equal for everyone.
27. eliminate non testable devices.
28. annual testing
29. educate the public on the importace of backflow
30. increase maintenance and testing and testing to be more stringent
31. Just keep testing yearly
32. Allow ASSE 5110 Certified Testers the ability to repair irrigation backflow preventers.
33. Allow for some sort of certification so repairs can be completed by certified testers who are not licensed plumbers. Provide an opportunity for training all certified testers on how to properly complete repairs.
34. I feel very confident in our testing and our testers
35. Customers having better knowledge of what their devices are doing
36. Use only high quality backflows
37. In my area we are given a short time period to test many devices, which in my feeling is causing testing to be rushed in some cases and not completed properly, I would like to see due date for testing a device be by end of calendar year instead of being required to complete them all in just a couple short months in said year
38. Required annual testing on all devices. Commercial, Industrial, and Residential.
39. Educating the public.
40. The need for strainers up stream of BFP's and the need for check valves up stream or down stream of the BFP to help with water hammer. This all situational, based on water conditions/quality and types of locations (commercial/industrial).
41. ?
42. Nothing.
43. Evenly enforce the testing of them. No one hold the [Customer name ommitted] accountable for the nearly hundred of backflow units when all the neighboring business and municipalities are held to the annual testing. On top of the [Customer name ommitted] being a high hazard site.
44. All communities testing every 3 years

45. Must be installed by licensed plumber ! Tested by certified individuals. Nobody regulates who installs, including local municipalities. To many lawn irrigation and general labors installing incorrectly.
46. Some cities water systems is really bad. If we could get rid of some of the rust.
47. Local water departments and agencies need to be more informed on asse testing so they understand more
48. Test every 6 months
49. Backflow testing of course
50. better documentation
51. Consistency in cross connection control enforcement
52. Only sell PARTS OR SUPPLIES TO licensed ASSE registered Master Plumbers. In similar sense it is unlawful to sell mechanical equipment or parts to unlicensed contractors.
53. Better tracking and follow through on testing of devices. Once ordinances are set and being adhered to, I feel that it would reduce finding/testing assemblies that have not been tested in several years. In turn assuring assemblies are in proper working order.
54. Make sure all communities have a cross connection program
55. Seems the only thing you can do is more testing
56. The only thing I would change is it's MANDATORY that any assembly not accessible without a ladder or man lift be relocated to reasonable elevation. Have you ever tried wrestling a octopus and writing about it on a ladder?
57. some areas don't get notified to have test done
58. Mandatory 10 year rebuilds?
59. Open book hands on test to make sure everything is dine correctly.
60. Just use honest testers!
61. Only licensed plumbers should be able to test and repair backflows, seen some of ASSE testers are passing backflows because they aren't certified to rebuild backflows when they fail. Also most municipalities don't require PVB's to be tested they are a high hazard device
62. Require that the business post certification in their lobby as to the last time their backflow was tested and continue dual reporting (municipality and clearinghouse such as [Company name omitted] website). The forms should be legible when submitted to be able to verify that the person testing is licensed to do so. Half the time a signature is scribbled on. We had a company in our area that allowed their "helpers" to test backflows and pull plumbing permits for inspections with a non-licensee. This poses a direct threat to the safety and health of our community. I believe the issue has been rectified, but it went on for far too long.
63. Maintenance regimen
64. These protections have been a requirement for a long time. You are just now enforcing amd informing us of it? Document every location required, as should have been happing all along, and leave it up to people who are local and care to handle.
65. Test more frequently. I think 5 years is to long to insure that BFP's are functioning properly.

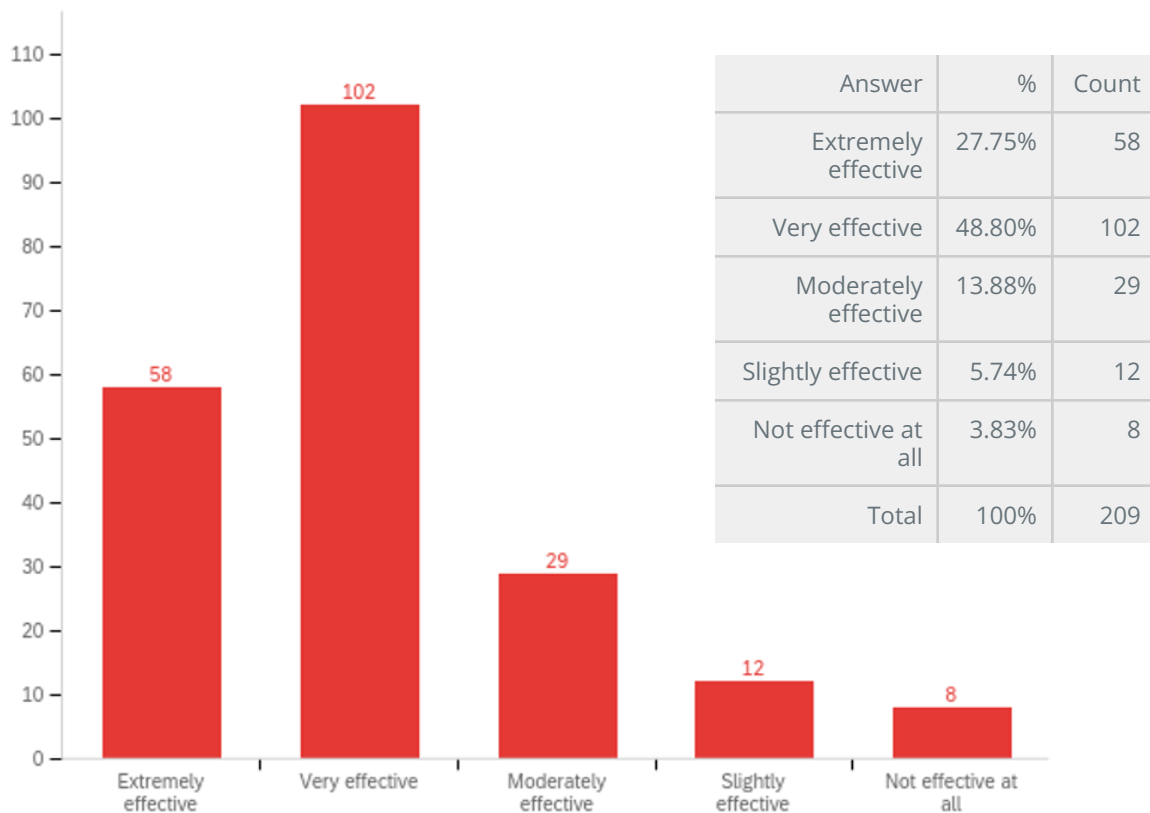
66. Have fire protection check all fire protection and plumbers check plumbing. most plumbers do not carry a fire protection license and their backflow is listed as a fire protection assembly.
67. testing is fine as is.
68. Frequency of testing and municipalities enforcing compliance quicker
69. Make sure they are licensed plumber and ASSE certified. The people that are not licensed plumber and are allowed to test but not repair are not qualified
70. Test heavily used devices twice a year
71. Educate the owners and building maintenance
72. I often see backflows that are not on the list to be tested . I'll go into a boiler room to test a backflow and quite often see other backflows that are not on the list
73. Stop the guys who aren't DOING the test. They're simply filling out the test form and submitting it. Very frustrating because, as you know, the customer does not want to have to pay for repairs.
74. We believe in our area these assemblies are being taken care of well, so we do not have any suggestions for improvement.
75. Take Backflows out of the box stores because DYI are installing them incorrectly or at all and home owners are not testing or reporting them and how can the irrigation company's can rebuild PVB and not be licensed plumbers they told me as long as it is outside they can do the rebuild or replacement training I received never said that I'm a tester and cannot rebuild or replace in my facilities but they can?
76. Make ALL Municipalities have annual testing programs in place . Or fine the municipality's that don't comply.
77. Get more testers. The cost of the liscense is stopping people from getting it.
78. The best practice to make sure is prevention rather than cure so mandating that Backflow preventers are tested at a minimum annually would be best practice in making sure valve functions properly and to make the tester proactive on repairs. Also by testing annually as a tester you're able to catch defects based on your testing prior to failure in some cases
79. Impose a mandatory maintenance log for the devices to be submitted along with the annual certification
80. More uniform testing period
81. ?
82. Better location and accessibility. Require bypass if it is not possible to turn water off while testing and repairing.
83. uniform requirements state wide
84. I don't feel it's necessary to test them as often
85. Get manufactures to lower part cost
86. Not sure
87. Each City jurisdiction NEEDS to have record keeping
88. customer awarness

89. Environmental conditions can take their toll on the brass valves. This should be considered. An example would be a PVB in a boulevard that gets snow melting chemicals sprayed on it by the snow plow. There other industrial environments that are corrosive as well.
90. The state trusts certified testers to test the backflow device but requires a licensed plumber to repair them. Other states have backflow repair certifications (Florida for example) that allow certified testers to be able to repair backflow devices. I've come across devices that were clearly not repaired properly and they were done by licensed plumbers. Also - licensed plumbers are in high demand and are short staffed and overworked. This burden falls on the homeowner who must pay extra for a licensed plumber to repair a backflow device. Certified testers should be allowed to repair devices (after proper training), this will help keep prices in line for homeowners and cut down on confusion. As more and more communities mandate backflow testing, this problem will only get worse and repairs will be more expensive.
91. more frequent testing
92. that only licence plumers touch them
93. I don't think there is a way besides testing them
94. n/a
95. Better education of the community, and especially the businesses by the purveyors.
96. Regulation on the device owner
97. Mandate use of testing devices that print out results
98. Consistently enforce the rules/laws with consequences.
99. More frequent visit from city personel.
100.Bi-annual testing
101.Have a program manager that is in the trade and has a clue what needs to be done to maintain the 100s of not 1000s of devices on campus.
102.Ensure they are installed in accessible locations
103.Nothing, they are easy to test and repair. Unfortunately they are mechanical devices, there is no way to ensure they are in good order one day and could fail the next.
104.Have the water purveyors treat their water to remove minerals.
105.Installation by an ASSE certified tester.
106.Stop non-licensed plumbers from installing backflow devices
107.Consistency & Accountability. Additionally would like to see the Cities and Reporting Agencies work better with the ASSE Licensed Plumbers - instead of against them.
108.Probably ask for annual inspections on all assemblies in all jurisdictions.
109.require more testing and visual inspections
110. To verify new devices are tested when installed for newly constructed buildings.
111. HAVE A STATE WIDE CROSS CONNECTION PROGRAM THAT ALL MUNICIPALITIES MUST FOLLOW.

-
112. Change all testing frequencies to annual testing and only allow for repairs to be completed by a licensed plumber. When repairing a backflow preventer there are many things that can go wrong beyond the actual backflow preventer. Such as issues with a valve, water hammer, broken pumping fixtures, not to mention the intricacies when testing a backflow preventer on a fire suppression system. The average tester that is not a licensed plumber can cause a great deal of damage if they are not familiar with hydraulics and how to repair plumbing systems.
113. A licensed plumber should not be the only individual to repair or replace the backflow. An ASSE tester should also be certified to repair and replace device.
114. More enforcement of annual testing and required repairs.
115. everyone should use the same forms and testing report site like hydrossoft.
116. Allow testers that aren't licensed plumbers to repair backflows We know how to do it and it can streamline the process and subsequent costs/logistics. Frequently we know more about repairs than a plumber that isn't certified to test them.
117. Annual testing in alignment with all manufacturers and associations' recommendations.
118. Annual testing
119. Ensuring that they are properly winterized, most of the issues we see are due to freeze/thaw cycle from Michigan winters
120. Don't let fire protection companies test, they can't repair so what's the point?
121. annual testing of ALL assemblies not just what is convenient and all testers must be licensed plumbers
122. More often testing. Annually for all of them would be better.
123. Better Education of the Public at Large for the purpose of the Backflow preventer and the Health Consequences of not having a proper operating Backflow Device.
124. Let certified backflow testers only repair devices whether they are licensed plumbers or not. Just because they are licensed plumbers doesn't mean that they know backflow devices.
125. Require y strainers for all RPZ and DC
126. Every device in every location with ANNUAL testing with comprehensive reports forms that were completed by competent certified testers, as opposed to drive by inspections, by those trying to make a quick buck, inspected by those who don't know/care about water quality. (Tester-Inspector-Cross Connection Program NEED to work together)
127. Allow certified testers to make repairs. I've seen plenty of improper testing and repairs done by licensed plumbers.
128. First of all if a new device is installed or an existing device is repaired or tested there is no guarantee that the device will fail an hour after you leave. So if the devices are looked at once a year that would be the longest a device would be failed. Annual testing would help.
129. Winterizing procedures are not properly.
130. Accountability
131. Allow ASSE certified testers to make repairs. I've seen too many "plumbers" pass an assembly just to move on and test more.
132. Install all assemblies inside
-

133. Annual testing
134. Better water in many municipalities
135. Develop new certification programs for backflow repair and installation technicians. At the same time, remove regulation and requirements for installation to be solely by plumbing firms and allow persons certified by former certification programs. Clearly, just because someone may be a plumber does not mean they have a full understanding of the standards for the installation and repair of backflow preventers.
136. Go back to requiring testers to be licensed plumbers. I often see repairs done with aftermarket parts.
137. Annual testing across the board for all assemblies.
138. No rpz on any fire systems unless it has a freeze agent in the lines
139. EGLE to enforce programs be competent rather than "paper tigers" and require annual testing on commercial and residential systems. EGLE provides very little support.
140. Inspectors need to be more diligent on enforcing that the original installation of the backflow preventers are per code meaning that they are installed in an accessible location. This will facilitate future testing and maintenance of the device.
141. Modify the licensing class.
142. Not sure
143. All municipals to have an annual frequency
144. Annual testing.
145. Lower the cost of tester training and certification, more training classes.
146. Allow testers to do repairs, or have a repair certification class put into place in Michigan.
147. Easier access to assembly, i have some backflows that are in hard-to-reach places, makes it tougher to do a thorough inspection
148. Buildings owners should be required to sign affidavits noting they are personally responsible and can be held criminally liable if found negligent. Irrigation contractors are often guilty of installing or repairing units which leads to units being installed contrary to regulation. More education for the consumers about the dangers of cross connections. The first question I ask when a new customer calls is "Do you know why this is required?" If they answer in the negative, I often ask if they have time for an explanation. This breeds customer trust and dispelled the myth that this is a City money making policy.
149. Allow no plumber testers to take additional certification to be able to also repair.
150. Nothing
151. We frequently see devices installed in places that are difficult to reach, which makes maintaining / testing difficult. To use the phrase uttered by real estate agents: Location, Location, Location!
152. standardized test form used throughout the state. every city has its own forms and some cities demand more than others. it can make it confusing for some.

8 - I feel that the ASSE 5110 testing certification process is _ in ensuring testers in Michigan are knowledgeable.



8a - Please leave any further explanation here.

62 entries total, responses are direct quotes from participants

1. The test and recertification is not easy by all means. The job requires intelligent people so the demands of asse certification are necessary.
2. I like the fact we have to recertify . It keeps testers up to date
3. Recertification is to much frequency
4. tested for 18 years before being forced to get a 5110 ASSE certification. test procedures used are the same. now just cost me more moneyto maintain my certification which gets passed along to the customer.
5. One of the questions i had was "when should you test a backflow?" Two of the answers were right and my instructor told me to pick the "more right answer".
6. It lays the groundwork for consistency. But it doesn't guarantee enforcement.
7. Why does we have to recertify every three years when there are no changes to the test procedures?

-
8. There is always room for improvement.
 9. the cert renewal class should allow the book to be used for testing devices as it is in the field.
 10. i personally did not see much difference from my original training in 1985 just more time and cost
 11. i wish the government would do a better job here the people having jurisdiction think testing and maintenance isn't that important
 12. In the state of Michigan journeyman plumbers can test backflow preventers. AR test for a journeyman plumbers license is 8 hours and it is an open book test. The test for for backflow preventers should also be an open book test.
 13. I believe in being consistent with my testing. I always follow an instruction sheet. The renewal test requires us to test from memory--I disagree with this. I fear that a step may be skipped.
 14. Very good training
 15. We must improve awareness and strictly enforce the laws concerning installations .
 16. Over kill
 17. We should not have to be tested by memory how to test while in the field we can use instructions
 18. [Name and Comapny Name ommitted] does a great job in his classes. Very informative. Very friendly, personable, professional environment. He is also available anytime a student has questions. Inside/during his classes as well as outside/after the class. If its a question about submitting forms or when/where classes will be. He has been very helpful
 19. All it ensures is the ASSE gets a large sum of money from Michigan plumbers. I have never met, in the 6 years I have had my ASSE certification, a inspector from the establishment. Also, the price gouging for classes is absurd.
 20. the ASSE 5110 testing certification process is very thorough
 21. A big problem in Michigan is our testing cycle in regard to weather. Most purveyors I've dealt with require test to be complete before winter. I think that's fine for PVB's and the occasional RPZ for irrigation. But all testing is complete. So the majority of us don't test between October thru March. Even a baker feels awkward when they haven't made bread for 6 months.
 22. Nada
 23. Only effective to those who are licensed plumbers and who keep up with their certifications. We would like to send a few more for training/certification, but the cost would be over \$2000 per person to send them. So we just have the one certified master plumber handling backflow testing and he's in his 60s. If there were an incentive to small businesses to certify their staff at a lesser cost, that would be great!
 24. Why did I do this and then have to report it online with every little detail? Why get certified when I can send out a high-schooler on summer break to test, and then enter the numbers online?
-

-
25. To be honest why is the testing procedure and written portion closed book? When I took the master plumber exam it was open book. So backflow testing is more important then being able to install all the piping around the backflow preventer. The test is set up for me to fail, which in turn ASSE can make more money when I have to retest and also retest every three years. Update classes should be required to take but retesting is a simple, greedy money grab by ASSE.
 26. don't need to memorize testing of 4 assemblies by memory when we have the testing procedures in or pocket manuals
 27. I feel that a lot of the customers don't understand the purpose of a backflow preventer
 28. Recertification is by far an expense that should be changed. If you want mine other testers solution, please get a hold of me.
 29. I'm curious as to what extent this information will be used and if you have any further questions or would like to further discuss 5110 I am a certified asse tester/repairer instructor and proctor for local 190 feel free to contact me at [contact information omitted]
 30. More time is needed to ensure testers understand the workings of assemblies and not simply memorize the steps.
 31. I feel the class over the years has made me a better tester. Also i don't feel that companies without a Master Plumber on staff should be able to test and repair BACKFLOW preventers. like fire protection companies.
 32. Make the process easier. We don't have enough certified individuals to even test the backflows.
 33. Retraining and recertification every three years is a little excessive a lot of plumbers I know gave up testing because of it. This has caused a shortage of testers in my area
 34. You have a better understanding of what is happening inside the backflow
 35. Too much emphasis on the procedure. Not enough regarding Understanding the device how it was constructed and how it operates. This is fundamental to training the technician and getting reliable test results.
 36. The cost to maintain your license is very expensive. You have to do a lot of testing to make up that cost
 37. Not a huge fan of the 25 question test but it gets the job done. I feel like the practical testing is exactly what we need no changes there.
 38. The ASSE certification is barely effective. Most new testers, and the majority of seasoned testers, don't really understand how backflow assemblies really work and what the test gauge is telling them. It's like a doctor getting test results and not understanding what he/she is looking at. A new tester is like a 16 year old getting a driver's license. Every 16 year old thinks they know how to drive, yet accident statistics prove otherwise.
 39. The certification process is good. It is those that test without the certification and have someone else do forms that is the problem.
-

-
40. Testing devices from memory is ludicrous. Never in the field would a technician attempt to test a device from memory. Just have a proficiency test and verify the testers competence.
-
41. The ASSE testing requires a tester to be qualified. When i originally received my license in 2004 it was through the Local union and the test was not done correctly. No one failed.....
-
42. The testing is intense as it should be. A person can't just show up and pass. It takes real effort to pass.
-
43. I BELIEVE THAT ONLY LICENSE PLUMBERS SHOULD BE ABLE TO TEST BACKFLOWS.
-
44. I appreciate that testers have to take a written exam and a practical exam to prove their testing capabilities. Having to renew the ASSE certification every three years also helps minimize the less knowledgeable/experienced testers by creating an investment in their certification.
-
45. Schools should be audited random basis
-
46. Is what it is, seems like ASSE is a cash grab as compared to previous system.
-
47. recertification every 3 years seems unreasonable every 10 years would be sufficient
-
48. There are people who test very few BFPs yearly that probably shouldn't be licensed to do testing. They don't do enough of them to be familiar with problems and how to repair them.
-
49. I became a tester in 2005. Three years ago i had to get re-certified to continue testing. I had not problems passing the written test and practical tests but there were two who failed the tests. Talking with them during the classes it was obvious they were questionable testers. I believe if you passed once and then are re-certified once your lic.should be just a renewal like my Master Plumbing lic.
-
50. I passed the certification and re-certification with 100%. I have a background of 140 credits toward BS in Biochemistry BA in Biophysics. You can test and train anyone, but their personal ethics needs to be there. There have to be repercussions/penalties to mistakes/willful disregard for public safety. I have read the trade magazines (MI P&M Contractor Vol 17, #1 Spring 2021 pg. 17 by Sean Cleary) with 12+ people over looking a cross connection, with the lowest person blowing the whistle on the cross connection in an elementary school. This illustrates the problem I have seen too many times.
-
51. I have seen some testers that test very few devices a year and struggle to remember the procedure when they need to.
-
52. I've been testing backflows for over 15 years, having to recertify,
-
53. The previous test procedure was more effective way to test
-
54. There are still testers that do not have a complete understanding of what they are doing.
-
55. The places that do the recertification near [community name omitted] are only in it for the money grab. Absolutely no help and will probably get out of it for that reason
-
56. It would be nice if there were more recirtfication sites I have 8 hour drive to retest its a lot if money for something not forced in my town
-

57. It is only moderately effective because there has been no way to get rid of the fraudulent testers. ASSE could also do a better job of monitoring school as some are much better than others. The MPMCA school should not have ASSE approval, thankfully there are better options now. At least it is an improvement because before ASSE certification some schools were terrible and passed everyone and testers did not have to demonstrate maintaining their skills. Before ASSE certification it was not effective at all.

58. The test needs to be reconfigurd to meet the needs of available testers.

59. ASSE testing ensures everyone is testing the same way.

60. The course is very in-depth and informational, i felt well trained with my certificate

61. A three day, 24 hour class would be sufficient. There is little a few days can do to teach more than the basics. The real world experience is where real knowledge is gained. Personally, I feel the 2 year renewal process is unnecessary but, then again, I am highly proficient. No amount of class time will teach ethical values.

62. N/A

9 - How long have you been involved with/worked in the water industry?

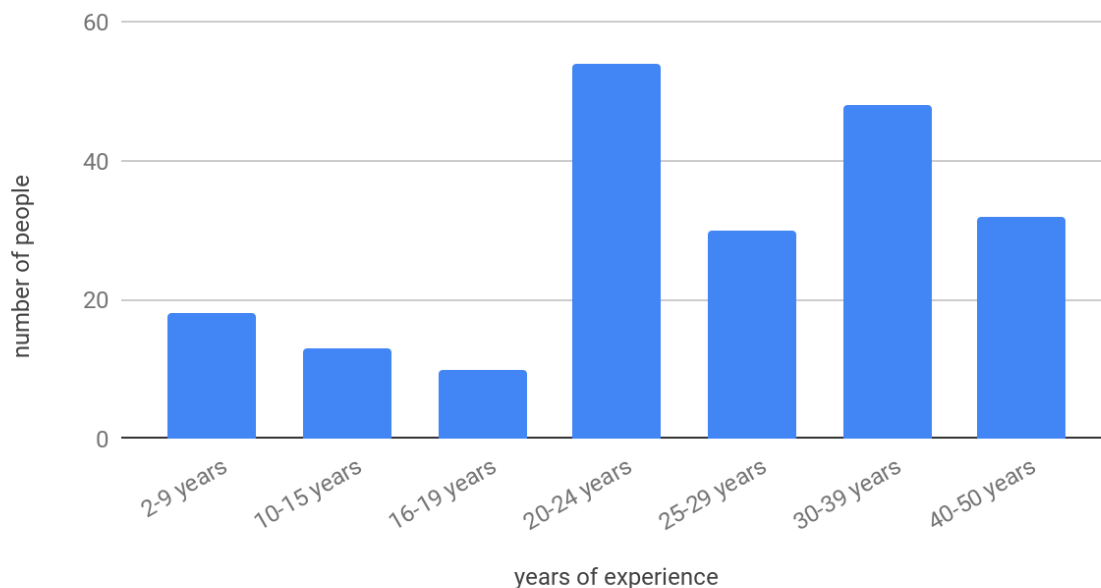
Average: 26

Minimum: 2

Maximum: 50

Total response count: 196

Testers: Experience in the Industry



Survey Data (continued)

Plumbing Code Officials (11 questions total)

Report generated August 24th 2021, 10:44 am EDT

1 - I have sufficient time and resources to focus on backflow prevention during my routine code inspections.

Answer	%	Count
Strongly agree	28.57%	2
Somewhat agree	57.14%	4
Neither agree nor disagree	14.29%	1
Somewhat disagree	0.00%	0
Strongly disagree	0.00%	0
Total	100%	7

2 - How much of a focus is backflow prevention in your routine code inspections?

Answer	%	Count
A great deal	42.86%	3
A lot	28.57%	2
A moderate amount	14.29%	1
A little	0.00%	0
None at all	14.29%	1
Total	100%	7

3 - I believe plumbing code inspectors receive sufficient training in Michigan to identify and correct potential cross connections.

Answer	%	Count
Strongly agree	0.00%	0
Somewhat agree	71.43%	5
Neither agree nor disagree	28.57%	2
Somewhat disagree	0.00%	0
Strongly disagree	0.00%	0
Total	100%	7

4 - I communicate with the local water supply officials regarding my plumbing code inspections of new construction to ensure both of us agree on the backflow prevention strategy.

Answer	%	Count
Always	28.57%	2
Most of the time	14.29%	1
About half the time	14.29%	1
Sometimes	28.57%	2
Never	14.29%	1
Total	100%	7

5 - I encounter disagreements with the local water supply officials related to interpretation of backflow prevention requirements for new construction.

Answer	%	Count
Always	0.00%	0
Most of the time	14.29%	1
About half the time	0.00%	0
Sometimes	28.57%	2
Never	57.14%	4
Total	100%	7

6 - I feel the Michigan Plumbing Code is sufficiently clear, specific, and up to date to make backflow prevention determinations during inspections.

Question	Strongly agree		Somewhat agree		Neither agree nor disagree		Somewhat disagree		Strongly disagree		Total
Clear	28.57%	2	57.14%	4	14.29%	1	0.00%	0	0.00%	0	7
Specific	16.67%	1	50.00%	3	33.33%	2	0.00%	0	0.00%	0	6
Up to date	16.67%	1	50.00%	3	33.33%	2	0.00%	0	0.00%	0	6

7 - How often are your determinations challenged during routine code inspections?

Answer	%	Count
Never	28.57%	2
Sometimes	57.14%	4
About half the time	14.29%	1
Most of the time	0.00%	0
Always	0.00%	0
Total	100%	7

7a - What do you do to ensure your interpretations and decisions related to inspections are defensible?

6 entries total, responses are direct quotes from participants

1. What do you do to ensure your interpretations and decisions related to inspections are defensible?
2. Code book
3. I always carry a code book and confer with other inspectors on interpretation
4. quote code section that applies
5. Reference the plumbing code.
6. I have ASSE Backflow cert, interpretations are only up to the code official. If someone has a different opinion they need to try to convince me.

8 - I feel the local cross connection inspectors (water supply officials) in my area are ____ regarding backflow prevention concepts.

Answer	%	Count
Extremely knowledgeable	14.29%	1
Very knowledgeable	57.14%	4
Moderately knowledgeable	14.29%	1
Slightly knowledgeable	14.29%	1
Not knowledgeable at all	0.00%	0
Total	100%	7

9 - I think the state requirements to become a certified/qualified plumbing code inspector sufficiently cover backflow prevention concepts.

Answer	%	Count
Strongly disagree	0.00%	0
Somewhat disagree	28.57%	2
Neither agree nor disagree	42.86%	3
Somewhat agree	14.29%	1
Strongly agree	14.29%	1
Total	100%	7

10 - Do you have suggestions for improvement on how to ensure construction of new plumbing is free of unprotected cross connections?

3 entries total, responses are direct quotes from participants

1. Do you have suggestions for improvement on how to ensure construction of new plumbing is free of unprotected cross connections?
2. Plan reviews and thorough inspection
3. The State could require all commercial buildings have backflow preventers

11 - How long have you been involved with/worked in the water industry?

7 entries total, responses are direct quotes from participants

Range: 14-42 years

Average: 29 years

1. 35
2. 18 years
3. 30
4. 20+
5. 42
6. 14
7. 27years

Interview procedures

Participants had the option to leave their name and contact information at the end of the surveys. The following prompt appeared upon completion of the survey questions:

Thank you for completing this survey. Your answers will remain anonymous unless you would like to provide further feedback via an interview. If so, please leave your contact information for Mikayla to contact you. *Due to the volume of those interested in providing further feedback, it is possible that time will not allow for direct interviews with all who are interested. Considering this, if you prefer, please feel free to email immediate feedback to mikayl@umich.edu.*

*Italicized text was added to the last two surveys (the Testers and PCO's) as the end of the project was approaching

Participants were contacted using the information they provided during normal weekday business hours from mid-July through August. A total of 112 individuals expressed interest in providing further feedback via an interview. Within the time following the surveys, 48 calls were made (roughly 42% of all 112). Of these, 17 (35% of 48) interviews were conducted and 29 of the calls were not returned after the intern left a voicemail.

See Figures 4 and 6 in appendix for scripts used to [conduct interviews](#) as well as [participants' interview comments](#).

	Group Size	Interested in interview	Interviews conducted
Engineer	37	3	1
Personnel	121	19	4
Testers	1636	88	11
PCO's	85	2	1
Totals	1879	112	17

This public copy does not include the direct interview feedback collected from respondents.

Interview feedback is available upon request.

Recommendations on Project Procedure

The introductory emails were intended to provide validation of the survey links that followed. There were, however, some participants that expressed uncertainty of whether they should trust the link. To address this in the future, one option would be to inform participants of the project at an earlier date using a more reliable form of communication. Asking offices to post signs in physical and virtual spaces where potential participants frequent could also bolster awareness.

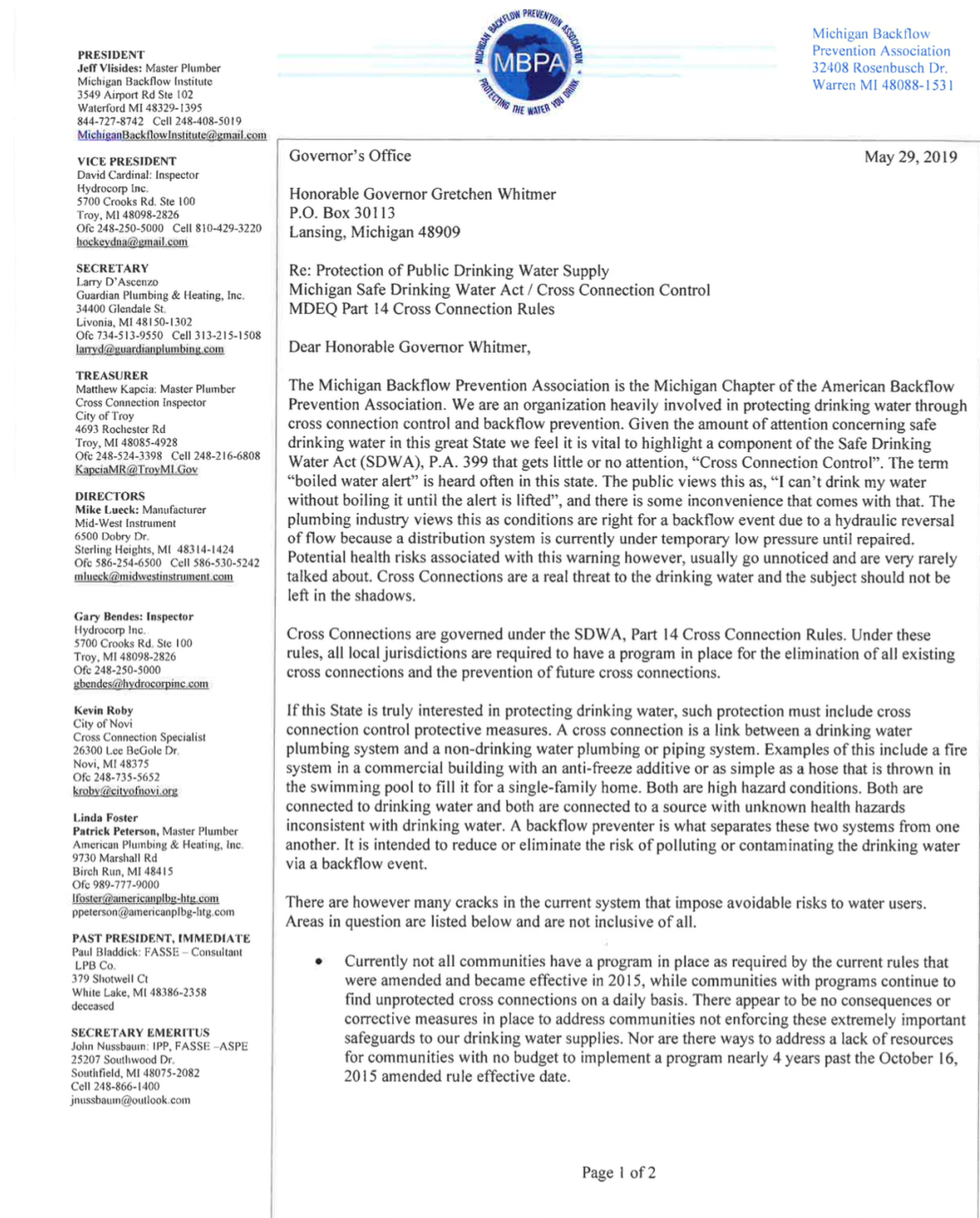
Participants seemed more receptive and willing to share feedback after mentioning the entire scope of the project at the beginning of phone calls. This may also be something helpful to include in the initial point of contact. If a similar project were to be carried out, those who would do so could utilize site visits in various areas to directly inform an area of an incoming survey and gain a firsthand understanding of what a certain location is like by interacting with locals. These direct interactions could encourage participation, and by selecting certain locations, site visits could also aid in generating a more random sample size and in gaining feedback from a particular demographic.

Appendix

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Figure 1a. 2019 Letter from the Michigan Backflow Prevention Association (MBPA)





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Warren MI 48088-1531

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PAST PRESIDENT, IMMEDIATE

Paul Bladdick: FASSE – Consultant
LPB Co.
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deceased

SECRETARY EMERITUS

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25207 Southwood Dr.
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Cell 248-866-1400
jnussbaum@outlook.com

- Michigan Plumbing Code (pg. 22) Section 312.10.2 Testing – states testing shall be at least annually. Many municipalities have adopted different testing intervals at 3 and 5 years instead of the annual code requirement specifically referenced in the SDWA Part 14 Rules. What is the purpose of having multiple testing intervals if the intent is to determine that the assemblies are functioning properly? Test failures are common as these assemblies are mechanical in nature and are subject to extreme temperatures. It would appear that the plumbing codes are concerned with protecting the water and the cross connection rules are concerned with politics. Conflicts between the two laws must be resolved.
- There is currently no solid partnership between local jurisdictions, the MDEQ and all stakeholders, which would enable these programs to operate in an effective and consistent manner. Currently the MDEQ has indicated that it is up to each community to decide how to protect their drinking water. The Part 14 Cross Connection Rules however, are very specific and this approach leads to inconsistent enforcement from community to community. If the State is serious about protecting the drinking water, all jurisdictions must enforce the same rules and the MDEQ should provide clear guidelines for all jurisdictions to follow in order to achieve consistent enforcement of protective measures.
- There is currently little or no public education on this subject.
- Multiple conflicts exist between State laws concerning these programs and are in need of resolution. In 2015, some changes were made as a start. Four years later it is time to take what we have learned and make all necessary corrections and smooth out the wrinkles.

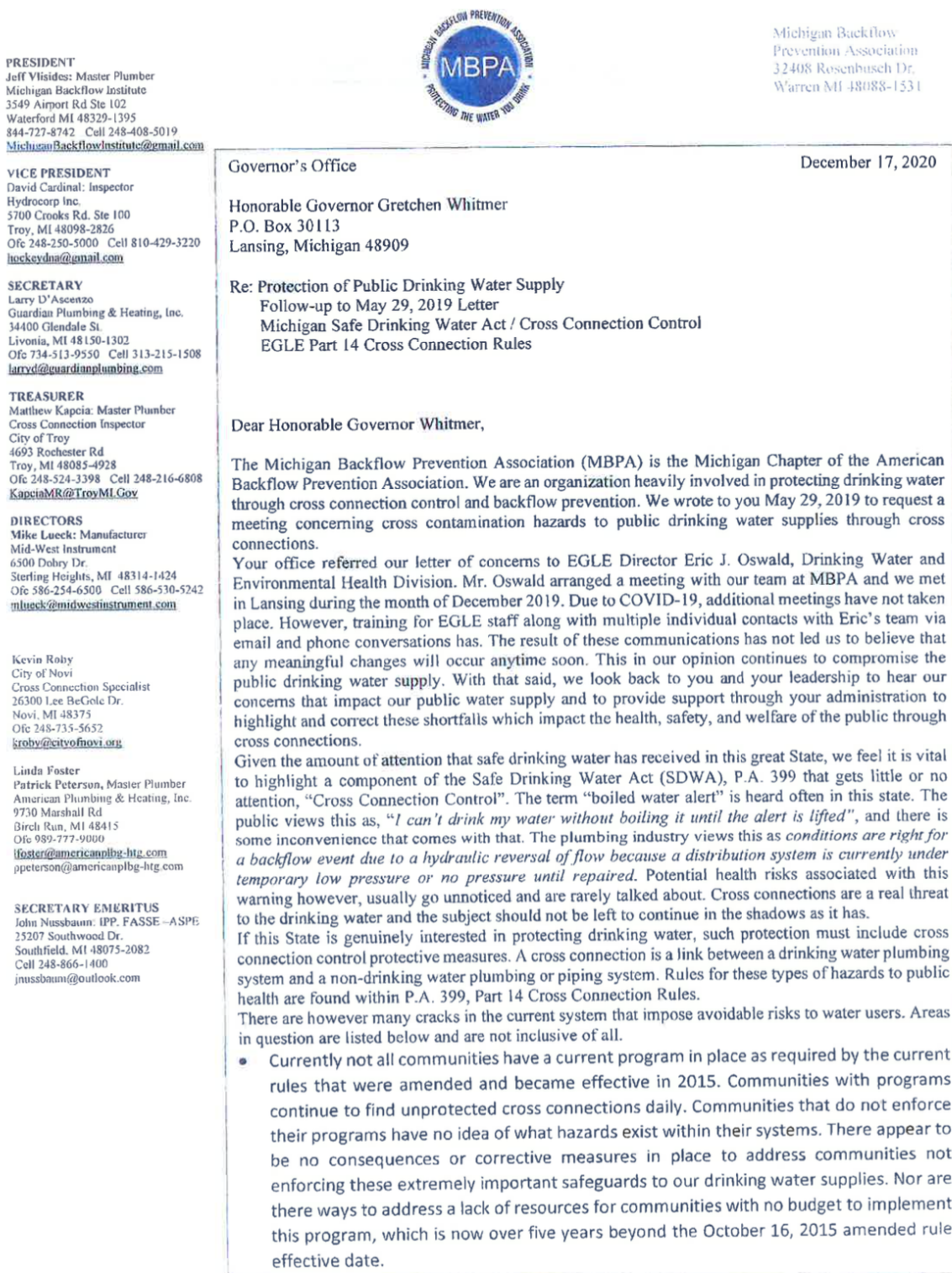
Given the current concerns with Michigan's drinking water that have made news across this country regarding lead and now PFOS, we believe it to be extremely important to discuss this topic in detail and fix what needs to be fixed. In order to achieve this, all stakeholders must come together and evaluate what the current laws in place require us to do, make changes where it makes sense, clearly define each parties' responsibilities and limitations, educate the public, create consistent enforcement policies and establish solutions for those communities with no resources. With what we currently know about water contamination hazards it should be clear that this topic is in need of a full review and reinvention to meet today's needs for protecting the health, safety and welfare of the public.

Based upon the above we would like to meet with you and your administration to discuss these issues in detail and offer our assistance and expertise on this public health related topic. Our association makeup has a wide range of experience including suppliers, testers, plumbing contractors, master plumbers, local water authority administration, inspectors, and certified water operators.

Very truly yours,
Michigan Backflow Prevention Association
Board of Directors

Jeff Vlisides
President MBPA

Figure 1b. 2020 Letter from the Michigan Backflow Prevention Association (MBPA)



PRESIDENT

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Michigan Backflow Institute
3549 Airport Rd Ste 102
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Michigan Backflow
Prevention Association
32408 Rosenbusch Dr.
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- There is currently no solid partnership between local jurisdictions, EGLE and all stakeholders which would enable these programs to operate in an effective and consistent manner. Currently EGLE has indicated that it is up to each community to decide how to protect their drinking water. The Part 14 Cross Connection Rules however are very specific as to what is required, and this approach leads to inconsistent enforcement from community to community. If the State is serious about protecting the drinking water from cross contamination hazards, all jurisdictions must enforce the same rules and EGLE should provide clear guidelines for all jurisdictions to follow in order to achieve consistent enforcement of the required protective measures.
- Currently there are no certification or training requirements for the enforcement agency (local water authority) to accurately evaluate plumbing systems and administer their local programs or public education for these types of hazards.
- Multiple conflicts exist between State laws concerning these programs and there are many challenges that enforcement agencies face that must be evaluated and in need of resolution. In 2015, some changes were made as a start. Five plus years later it is time to take what we have learned and make all necessary corrections and smooth out the wrinkles. To ignore this simply continues to compromise our drinking water supply.

Given the current concerns with Michigan's drinking water that have made news across this country regarding lead and now PFOS, we believe it to be extremely important to discuss this topic in detail and fix what needs to be fixed. In order to achieve this, all stakeholders must come together and evaluate what the current laws in place require us to do, make changes where it makes sense, clearly define each party's responsibilities and limitations, educate the public, create consistent enforcement policies and establish solutions for those communities with no resources. With what we currently know about water contamination hazards it should be clear that this topic needs a full review and reinvention to meet today's needs for protecting the health, safety, and welfare of the public.

Based upon the above, we would like to meet with you and your administration to discuss these issues in detail and offer our assistance and expertise on this public health related topic. Our association makeup has a wide range of experience including suppliers, testers, plumbing contractors, master plumbers, local water authority administration, inspectors, and certified water operators.

Sincerely,
Michigan Backflow Prevention Association


Jeff Vlisides
President MBPA

www.MichiganBackflowPreventionAssociation.com

2016110412

Figure 2. Further explanation of stakeholder groups

EGLE District Engineers

- Employed by EGLE
- Job duties include the evaluation of public water supplies to ensure they meet cross connection requirements. EGLE staff also help provide training to water system personnel specific to the cross connection industry



Pictured: EGLE Gaylord District Office

Water System Personnel (i.e. Cross Connection Inspectors)

- Usually employed by and representatives of the owner of the public water supply such as city, village, township, etc.
- Personnel include managers, lab techs, maintenance staff, treatment plant operators, water distribution (fire hydrants, water pipes, pumps, meters, etc) crews, and cross connection inspectors. In very small communities a single operator might do all of these activities, but larger systems often have specialized roles.

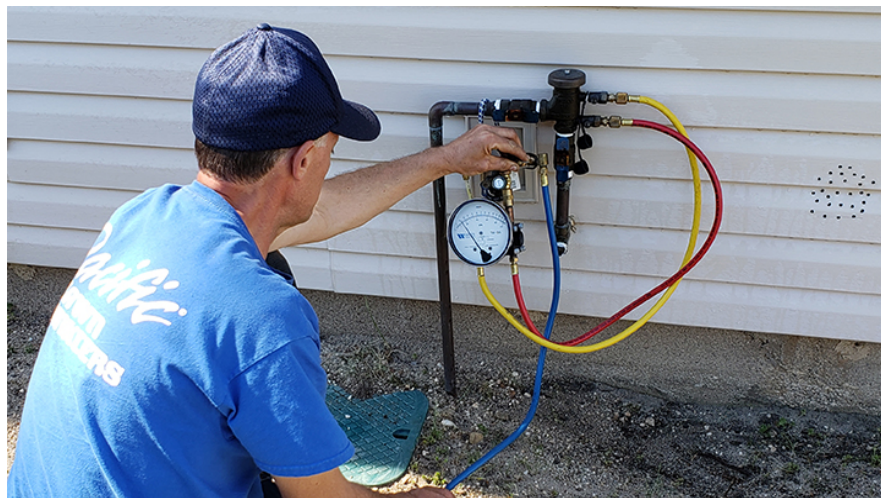


All water systems designate an individual to carry out the requirements of the local cross connection control program. The majority of this job is spent doing ongoing re-inspections of water customers to identify and eliminate cross connections. Another big portion is tracking the testing status of backflow preventers through the community. If a serious cross connection is found, the inspector may potentially shut off a customer's water service to protect from potential backflow. Note that inspecting plumbing and testing backflow preventers are different and separate activities.

Certified Backflow Preventer Testers

- Usually employed by a private plumbing & mechanical company
- Water customers hire them to test their backflow preventer and to submit the documentation to the water system to satisfy their testing obligations.

Often, they are licensed plumbers who do backflow preventer testing as a part of the company's various services. In order for test results to be considered valid, these testers must be ASSE 5110 certified, requiring them to attend a 40 hour course, pass a written and practical exam, and maintain continuing education.



Plumbing Code Enforcement Officials

- Usually employed by local governments, counties, or the state
- Their main role is to ensure *new construction* and/or changes to existing plumbing meets the standards in the Michigan Plumbing Code



Building construction requires the owner to get a permit from the code official. Before a new home or business is granted occupancy or allowed to open, it must pass all applicable code (plumbing, electrical, structural, etc.) inspections. Sometimes there are disputes between the code inspectors and the local cross connection inspectors regarding the necessary level or method of backflow prevention.

Water Customers [OMITTED]

These are the homes, businesses, and industries that are supplied water from the water system. Part of the terms of the agreement to sell them water, the water customers must comply with the local cross connection control ordinance. As such, they must grant the water system personnel access for inspections and agree to backflow preventer testing.



Figure 3. Introductory emails and message sent with survey links

General email message - context for survey

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water program administers the state's backflow prevention rules that apply to public water supplies. You are receiving this email because you have been identified as a *[insert stakeholder group]* in the state. In an effort to better understand the current state of the industry and identify trends across Michigan, we are cooperating with the University of Michigan to conduct an online, anonymous survey. This is a great opportunity to relate your experience, observations, and concerns. The results will be used to help guide the direction of EGLE's regulatory program in Michigan, and may also be helpful in future rule updates. The results will NOT be used to evaluate individual inspector performance.

Please be on the look-out for an online survey from Mikayla Mitchell, University of Michigan, Class of 2022!

Who: *[insert stakeholder group]* working in the state of Michigan.

What: Request for participation in an informational survey regarding the State of MI backflow prevention rules and program.

Where: Participation will be entirely virtual.

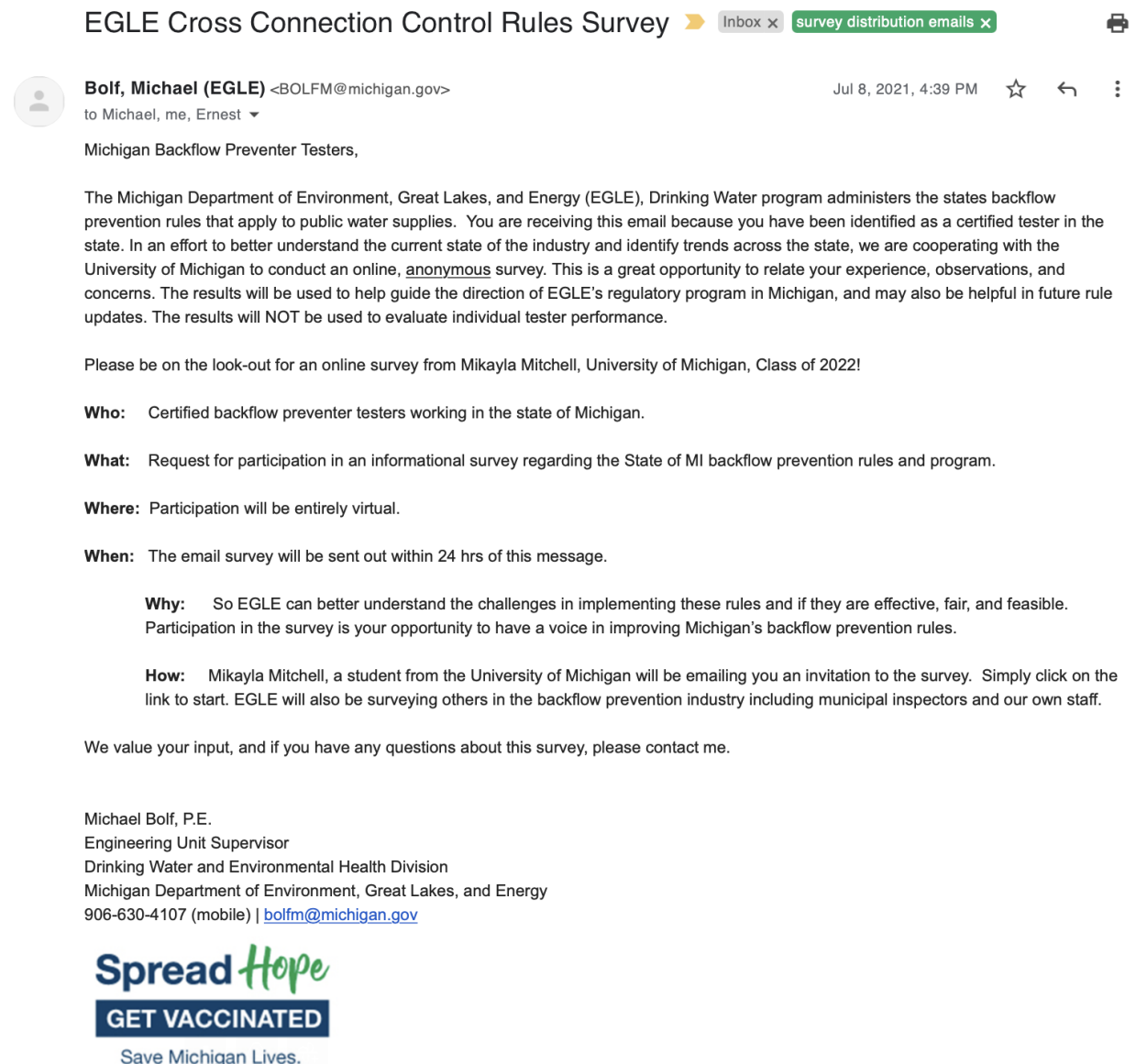
When: The email survey will be sent out within 24 hrs of this message.

Why: So EGLE can better understand the challenges in implementing these rules and determine if they are effective, fair, and feasible. Participation in the survey is your opportunity to have a voice in improving Michigan's backflow prevention rules.

How: Mikayla Mitchell, a student from the University of Michigan will be emailing you an invitation to the survey. Simply click on the link to start. EGLE will also be surveying others in the backflow prevention industry including municipal inspectors, backflow preventer testers, and our own staff.

We value your input, and if you have any questions about this survey, please contact me.

See example of delivered email to testers below:



General email message - link to survey

Hello,

This is Mikayla with the link to the brief survey Mike mentioned in the previous email (*insert link*). Your survey submission is anonymized meaning IP address and location data will not be collected with your response.


We are interested in feedback based on your pre-COVID experience. Your answers will be used to improve EGLE's regulatory program in Michigan. At the end of the survey, you will be given the option to provide your name as well as the opportunity to provide further feedback in an interview as time allows for the volume of those interested.


You will be able to leave and return to the survey at any time. The link will expire 3 months after you first access the link. Please feel free to email mikayl@umich.edu if you have any issues accessing the survey.

Thank you in advance for your time!

Follow this link to the Survey: *[insert link]*

See example of delivered email to testers below:

Survey for Certified Testers ▶ Inbox x survey distribution emails x 



Mikayla Mitchell <donotreply@umich.edu>
to me ▼

Jul 9, 2021, 12:44 PM ☆ ↶ ⋮

Hello,

This is Mikayla with the link to the brief survey Mike mentioned in the previous email ([EGLE Cross Connection Control Rules Survey](#)). Your survey submission is **anonymized** meaning IP address and location data will not be collected with your response.

We are interested in feedback based on your pre-COVID experience. Your answers will be used to improve EGLE's regulatory program in Michigan. At the end of the survey, you will be given the option to provide your name as well as the opportunity to provide further feedback in an interview as time allows for the volume of those interested.

You will be able to leave and return to the survey at any time. The link will expire 3 months after you first access the link.

Thank you in advance for your time!

Follow this link to the Survey:
[Take the Survey](#)

Best,
Mikayla Mitchell
University of Michigan | Class of 2022
College of Literature, Science, and the Arts
B.A. Environmental Studies
mikayl@umich.edu

Figure 4. Interview Scripts

Below are the scripts used for

- *Initiating interviews*
- *Specific interview questions for water system personnel*
- *the voicemail message the intern left if the call was not received*

General script for interview introduction (via phone call):

- Hello, is this [insert name of interviewee]?
- This is Mikayla following up from the survey you took regarding cross connections in which you indicated that you might have more feedback to provide. Is now a good time to follow up on your response?
- This call is unstructured and open for you to share comments, recommendations, or anything you want to elaborate on from the survey. However you would like to proceed, you are free to provide as much or as little feedback as you'd like.
 - ◆ *While I've been given a brief overview of cross connections and how the water industry works, water is not my field of study but I am more than happy to take note of all of your comments. My role in this time is to gather feedback and compile it into the final report.
- [insert any group specific questions/feedback]
- Ending: The purpose of this call is to give you the opportunity to give more feedback from your experience, observations, and concerns in order to inform the direction of EGLE's regulatory program in Michigan [on cross connections]. I will be compiling this feedback into a report for EGLE.
- I just have a couple things before we end:
 - ◆ Is it ok if your direct feedback is included in the report?
 - ◆ Is it ok if your name is attached to your feedback in the report? This is completely optional.
- Thank you again for your participation. Feel free to email me with anything else you might think of later at mikayl@umich.edu.

Water system personnel - specific questions:

- I just have a few open answer questions that expand on the survey content to get started. Following that, I can provide the survey questions for reference if you would like.

-
- How often do you find cross connection issues on newly permitted plumbing installations?
 - Are there any resources you find helpful in identifying, fixing, or educating the public about cross connections?
 - How often would you say there are disagreements between your personal interpretations of the CC inspection code and those of the plumbing inspector's?
-

Voicemail message:

Hi [insert name of professional]. This is Mikayla following up from the survey you took regarding cross connections in which you indicated interest in providing further feedback. The call is an unstructured interview, open for you to share comments, recommendations, or anything you want to elaborate on from the survey. You can call me back at this number to share your thoughts or email them if you prefer. If I am not able to answer your call, please feel free to email me a time that is good for you - as well as any questions. My email is mikayl@umich.edu. However you would like to proceed, you are free to provide as much or as little feedback as you'd like. Thank you again for participating, and I hope to hear from you soon!

Figure 5. Survey Questions - Plain Text, 7 pages

The following pages contain the **survey questions in plain text without participant data**; full visuality of survey layouts are available in preview links. Contact groups are in order of survey launch dates.

Contact groups:

1. [EGLE District Engineers](#)
 2. [Water System Personnel \(Utility Directors, Public Works Supervisor, Cross Connection Inspectors, etc\)](#)
 3. [Certified Backflow Preventer Testers](#)
 4. [Plumbing Code Enforcement Officials](#)
-

EGLE District Engineers

Preview survey link:

https://umich.qualtrics.com/jfe/preview/SV_01gpZmAJMJlwUce?O_CHL=preview&O_SurveyVersionID=current

Please select the most accurate statement.

1. The set of conditions necessary in rating a water system's cross connection control program (deficient, significantly deficient, etc.) are _ to me.
 - a. Extremely clear
 - b. Somewhat clear
 - c. Neither clear nor unclear
 - d. Somewhat unclear
 - e. Extremely unclear
2. I have received sufficient training and guidance materials to evaluate if a water system's cross connection control program meets the Part 14 requirements.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
3. Please list any measures you take to ensure your evaluation of a water system's cross connection control program is consistent with others statewide.
 - a. Open answer - text entry
4. Considering information in the water supply files and the information gained from the sanitary survey checklists, I feel that I have sufficient information to adequately evaluate the cross connection control program.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
5. Have you had the opportunity to accompany a cross connection inspector on an actual local cross connection inspection?
 - a. Yes
 - b. No

-
6. Appeared if selected yes: How useful or not useful was your local inspection experience?
 - a. Extremely useful
 - b. Very useful
 - c. Moderately useful
 - d. Slightly useful
 - e. Not at all useful
 7. When reviewing sanitary surveys with my supervisor, cross connection control consistency is discussed.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
 8. If there is any other feedback to improve the Part 14 rules and how they are implemented in Michigan, please explain.
 - a. Open answer - text entry
 9. How many years of experience do you have in the drinking water industry?
 - a. Numerical entry for amount of years
 10. Thank you for completing this survey. Your answers will remain anonymous unless you would like to provide further feedback. If you have additional suggestions to improve how the cross connection program is implemented, please leave your name and email address, and Mikayla will be in contact with you.
 - a. First name, last name, email, city, district

Water System Personnel (Utility Directors, Public Works Supervisor, Cross Connection Inspectors, etc)

Preview survey link:

https://umich.qualtrics.com/jfe/preview/SV_71xnPziBe40ticu?Q_CHL=preview&Q_SurveyVersionID=current

Please select the most accurate statement.

1. The state rules and guidance make clear what I must do to comply with the state's cross connection rules.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
2. In my view, EGLE is enforcing cross connection rules consistently in my region of the state.
 - a. Strongly agree
 - b. Somewhat agree
 - c. I don't know
 - d. Somewhat disagree
 - e. Strongly disagree
3. When was the last time EGLE was in contact with you to specifically discuss your cross connection control program?
 - a. Within the past 6 months
 - b. Within the past year
 - c. Within the past 3 years
 - d. no contact
4. Appeared if "no contact" is not selected: I get clear and consistent direction from EGLE staff on their expectations regarding my local cross connection program.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree

-
- d. Somewhat disagree
 - e. Strongly disagree
 5. Regulatory staff from EGLE check records to ensure testing and inspections are being completed.
 - a. More than once per year
 - b. Once a year
 - c. Every 3 years
 - d. Never
 - e. Unsure
 6. Do you think the current EGLE (Part 14) rules are effective in controlling backflow?
 - a. Extremely effective
 - b. Somewhat effective
 - c. Moderately effective
 - d. Slightly effective
 - e. Not effective at all
 7. Do you think your local approach is effective in actually identifying and eliminating cross connections as it relates to: *[Residential customers, Commercial customers, Industrial customers, Institutional customers (hospitals, schools, prisons, etc)]*
 - a. Extremely effective
 - b. Somewhat effective
 - c. Moderately effective
 - d. Slightly effective
 - e. Not effective at all
 8. Please rate how each element of your cross connection program impacts the goal of backflow prevention. *[elements: Inspections, Backflow testing, Education, Plumbing permits]*
 - a. Extremely effective
 - b. Somewhat effective
 - c. Moderately effective
 - d. Slightly effective
 - e. Not effective at all
 9. If you could change one thing about the state's cross connection rules, what would it be?
 - a. Open answer - text entry
 10. Does the cross connection control program status of a neighboring water system in any way impact your local efforts?
 - a. Definitely yes
 - b. Probably yes
 - c. Might or might not
 - d. Probably not
 - e. Definitely not
 - i. Please leave any further explanation here.
 1. Open answer - text entry
 11. We want to know if you have the following resources necessary to effectively carry out your local program. Please rate the adequacy of the following resources for your local program. *[resources: Funding, Training, Sufficient staffing, Record keeping needs, Administrative needs, Training to answer cross connection related questions]*
 - a. Extremely adequate
 - b. Somewhat adequate
 - c. Neither adequate nor inadequate
 - d. Somewhat inadequate
 - e. Extremely inadequate

-
- i. Are there other resources not listed above that you would like to give feedback on? Please leave any further feedback on accessibility, complications, etc. as it relates to the above.
1. Open answer - text entry
12. Water system decision makers (i.e. community officials in position of authority) support active enforcement of my local cross connection program.
- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
13. What is your opinion of EGLE's Cross Connection Control Rules Manual? **numeric values on a scale of 0-100 (0 being negative and 100 being positive) for each of the following*
- Useful
 - Confusing
 - Outdated
 - Necessary
- i. Please leave any further feedback to the Rules Manual. Open answer - text entry
14. How competent are your cross connection control staff trained in reviewing test report forms to verify the test is valid with regard to procedures, tester credentials, assembly ID, etc.?
- Extremely competent
 - Somewhat competent
 - Neither competent nor incompetent
 - Somewhat incompetent
 - Extremely incompetent
15. Do you believe there are enough checks and balances in place to ensure dishonest or incompetent testing practices are identified and corrected?
- Open answer - text entry
16. Thank you for completing this survey. Your answers will remain anonymous unless you would like to provide further feedback via an interview. If so, please leave your name and email address, and Mikayla will be in contact with you.
- First name, last name, email, employer, city, district

Certified Backflow Preventer Testers

Preview survey link:

https://umich.qualtrics.com/jfe/preview/SV_9ynSckNRGOgnOmy?O_CHL=preview&O_SurveyVersionID=current

Please choose the most accurate statement.

- How would you rate your or your company's ability to meet the demand for testing customer backflow preventers?
 - Meeting testing demands is no problem and we **may** have capacity for more testing
 - Meeting testing demands is possible, but occasionally difficult
 - The demand for our testing services exceeds our capacity
- In your experience, are testing requirements enforced consistently across the various jurisdictions you work with respect to **ASSE certification, test results reporting, and testing frequency**?
 - ASSE certification** (I see evidence that the local water purveyors in my region consistently verify that testers are ASSE certified and reject test results from noncertified testers.)
 - Test result reporting** (I see evidence that the local water purveyors consistently read/understand test reports, and evidence that they consistently reject false or incomplete testing forms.)
 - Testing frequency** (I see evidence that water purveyors in my region consistently require testing of backflow preventers on similar frequencies.)

-
- i. Strongly agree
 - ii. Somewhat agree
 - iii. Neither agree nor disagree
 - iv. Somewhat disagree
 - v. Strongly disagree
 - vi. I don't know
3. Based on the results of your testing, what **testing frequency** do you feel is necessary to ensure backflow prevention assemblies are in good working order?
 - a. More frequent than annual
 - b. Annually
 - c. Every three years
 - d. Every five years
 - e. Less frequent than every five years
 - f. Varies depending on multiple factors (assembly, water quality, application, etc)
 4. The majority of my customers trust that the purpose of testing their assemblies is to protect public health.
 - a. Definitely yes
 - b. Probably yes
 - c. Might or might not
 - d. Probably not
 - e. Definitely not
 5. In Michigan, do you believe there are enough checks and balances in place to ensure dishonest or incompetent testing practices are identified and corrected?
 - a. Open answer - text entry
 6. How often do you see evidence of backflow preventers being repaired or installed by non-licensed plumbers?
 - a. Almost always
 - b. Most of the time
 - c. About half the time
 - d. Sometimes
 - e. Almost never
 7. If you could change one thing to better ensure backflow preventers are in good working order, what would it be?
 - a. Open answer - text entry
 8. I feel that the ASSE 5110 testing certification process is _ in ensuring testers in Michigan are knowledgeable.
 - a. Extremely effective
 - b. Somewhat effective
 - c. Moderately effective
 - d. Slightly effective
 - e. Not effective at all
 - i. Please leave any further explanation here.
 1. Open answer - text entry
 9. How long have you been involved with/worked in the water industry?
 - a. Text entry for years and months
 10. Thank you for completing this survey. Your answers will remain anonymous unless you would like to provide further feedback via an interview. If so, please leave your name and email address for Mikayla to contact you. *Due to the volume of those interested in providing further feedback, it is possible that time will not allow for direct interviews with all who are interested. Considering this, if you prefer, please feel free to email immediate feedback to mikayl@umich.edu.*
 - a. First name, last name, email, phone number, employer

Plumbing Code Enforcement Officials

Preview survey link:

https://umich.qualtrics.com/jfe/preview/SV_cGhPOpIPUHYbZTU?Q_CHL=preview&Q_SurveyVersionID=current

1. I have sufficient time and resources to focus on backflow prevention during my routine code inspections.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
2. How much of a focus is backflow prevention in your routine code inspections?
 - a. A great deal
 - b. A lot
 - c. A moderate amount
 - d. A little
 - e. None at all
3. I believe plumbing code inspectors receive sufficient training in Michigan to identify and correct potential cross connections.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
4. I communicate with the local water supply officials regarding my plumbing code inspections of new construction to ensure both of us agree on the backflow prevention strategy.
 - a. Almost always
 - b. Most of the time
 - c. About half the time
 - d. Sometimes
 - e. Almost never
5. I encounter disagreements with the local water supply officials related to interpretation of backflow prevention requirements for new construction.
 - a. Almost always
 - b. Most of the time
 - c. About half the time
 - d. Sometimes
 - e. Almost never
6. I feel the Michigan Plumbing Code is sufficiently **clear, specific, and up to date** to make backflow prevention determinations during inspections. *[clear, specific, up to date]*
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
7. How often are your determinations challenged during routine code inspections?
 - a. Never
 - b. Sometimes
 - c. About half the time
 - d. Most of the time

-
- e. Always
 - i. What do you do to ensure your interpretations and decisions related to inspections are defensible?
 - 1. Open answer - text entry
8. I feel the local cross connection inspectors (water supply officials) in my area are ___ regarding backflow prevention concepts.
- a. Extremely knowledgeable
 - b. Very knowledgeable
 - c. Moderately knowledgeable
 - d. Slightly knowledgeable
 - e. Not knowledgeable at all
9. I think the state requirements to become a certified/qualified plumbing code inspector sufficiently cover **backflow prevention concepts**.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree nor disagree
 - d. Somewhat disagree
 - e. Strongly disagree
10. Do you have suggestions for improvement on how to ensure construction of new plumbing is free of unprotected cross connections?
- a. Open answer - text entry
11. How long have you been involved with/worked in the water industry?
- a. Text entry for years
12. Thank you for completing this survey. Your answers will remain anonymous unless you would like to provide further feedback via an interview. If so, please leave your contact information for Mikayla to contact you. *Due to the volume of those interested in providing further feedback, it is possible that time will not allow for direct interviews with all who are interested. Considering this, if you prefer, please feel free to email immediate feedback to mikayl@umich.edu.*
- a. First name, last name, email, employer, city, district

Acknowledgements

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